



August 8, 2013

Transmitted via electronic mail

U.S. Environmental Protection Agency, Region II
Emergency and Remedial Response Division
290 Broadway, 19th Floor, Room W-20
New York, NY 10007-1866

Attn: Ms. Alice Yeh
Remedial Project Manager

**Re: Quality Assurance Project Plan Field Modifications
Combined Sewer Overflow/Stormwater Outfall Investigation
Diamond Alkali Superfund Site (Lower Passaic River Study Area)**

Dear Ms. Yeh:

Tierra Solutions Inc. (Tierra) [funding and performing on behalf of Occidental Chemical Corporation], hereby submits to USEPA the enclosed Field Modifications to the CSO/SWO Quality Assurance Project Plan (QAPP) Revision 2, March 2013. The need for these modifications resulted from changes to one of the sampling locations (i.e., Ivy Street to Clay Street), and changes to field procedures (e.g., addition of "paper-like" material to analysis). The sampling location was changed due to the inability to obtain access permission from the Town of Kearny, therefore, the Clay Street location will be sampled a second time, per USEPA direction. The field procedures are proposed for modification as a result of improvements identified after field work was initiated. In addition, as requested, modifications from CSO_SWO Field Modifications 06.06.13 submittal are also included as proposed changes. All proposed modifications are shown in Track Changes (red-line, strikeout) to facilitate USEPA's review.

Pending receipt of USEPA's comments and/or approval of this submittal, Tierra will finalize the QAPP worksheets and Standard Operating Procedures and incorporate the documents into the CSO/SWO Quality Assurance Project Plan Revision 2, March 2013. The approved copy of the document will be titled CSO/SWO Quality Assurance Project Plan Revision 3, August 2013.

If you have any questions please call me at (732) 246-5920.

Sincerely,

Tierra Solutions, Inc.

Brian Mikucki
Environmental Scientist
On behalf of Occidental Chemical Corporation
(as successor to Diamond Shamrock Chemicals Company)

Enclosure

cc: Paul Brzozowski (Tierra Solutions Inc.)
Cliff Firstenberg (Tierra Solutions Inc.)
Diane Waldschmidt (Environmental Data Services)
Alain Herbert (ARCADIS)
Meredith Hayes (ARCADIS)



QAPP Worksheet #7
Personnel Responsibilities and Qualifications

Name	Title	Organizational Affiliation	Responsibilities	Education and Experience Qualifications
Paul Brzozowski	Project Manager	Tierra Solutions, Inc.	Project Coordinator	BS Civil Engineering/25 years
Brian Mikucki	Environmental Scientist	Tierra Solutions, Inc.	Project Scientist	MA Environmental Management/2 years
Alain Hebert	Program Manager	ARCADIS U.S., Inc.	Principal-in-Charge	MS Environmental Engineering/20 years
Charles Barnes	Technical Manager	ARCADIS U.S., Inc.	Senior Expert	BS Environmental Engineering/30 years
Meredith Hayes	Project Scientist	ARCADIS U.S., Inc.	Project Manager	MS Marine Science, BS Chemistry, BS Oceanography/10 years
Kavin Gandhi	Field Supervisor	ARCADIS U.S., Inc.	Senior Field Technician and Health and Safety Supervisor	MS Environmental Engineering/6 years
Diane Waldschmidt	Director	Environmental Data Services, Ltd.	Quality Assurance Coordinator	BS Chemistry/22 years
Elise Fracken	Senior Technical Specialist	Environmental Data Services, Ltd.	Quality Assurance Assistant	BS Chemistry/16 years
Kirk Young	Customer Service/Project Manager	TestAmerica, Burlington, VT	Laboratory Project Manager	BS Civil Engineering/33 years
Martha Maier	Laboratory Manager	Vista Analytical, Inc.	Laboratory Project Manager	BS Chemistry/23 years
Tiffany Stilwater	Project Management Group Leader	Brooks Rand Labs	Laboratory Project Manager	BA Environmental Science/5 years

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QAPP Worksheet #9-2
Project Scoping Session Participants Sheet
March 4, 2010

Project Name: Combined Sewer Overflow/Stormwater Outfall (CSO/SWO) Investigation			Site Name: Lower Passaic River Study Area		
Projected Date(s) of Sampling: September 2011			Site Location: Newark, New Jersey		
Project Coordinator: Paul Brzozowski					
Date of Session: March 4, 2010					
Scoping Session Purpose: Quality Assurance Project Plan (QAPP) Planning for CSO/SWO Investigation Plan					
Scoping Session Outcome: Tierra Solutions, Inc. (Tierra) and U.S. Environmental Protection Agency (USEPA) agreed to include a two-phased approach for implementing the CSW/SWO investigation and evaluated the sampling and analytical scope of this CSO/SWO Investigation QAPP. Tierra and USEPA discussed establishing Technical Work Groups to facilitate communication and information exchange between groups/members to assist in developing this CSO/SWO Investigation QAPP.					
QAPP Recipients	Title	Organization	Telephone Number	E-mail Address	Project Role
Alice Yeh	Remedial Project Manager	USEPA Region 2	212-637-4427	Yeh.Alice@epamail.epa.gov	Approval Authority Remedial Project Manager
Eugenia Naranjo	Remedial Project Manager	USEPA Region 2	212-637-3467	Naranjo.Eugenia@epamail.epa.gov	Approval Authority Remedial Project Manager
Stephanie Vaughn	USEPA Remedial Project Manager	USEPA Region 2	212-637-3914	Vaughn.Stephania@epamail.epa.gov	Approval Authority Remedial Project Manager
Paul Brzozowski	Project Manager	Tierra Solutions, Inc.	732-246-5851	paul.brzozowski@tierra-inc.com	Lead Organization's Project Coordinator
Alain Hebert	Principal Environmental Engineer	ARCADIS U.S., Inc.	609-860-0590, ext. 232	alain.hebert@arcadis-us.com	Investigative Organization's Project Manager
Lucas Paz	Principal Environmental Scientist	ARCADIS U.S., Inc.	212-682-9271, ext. 15	lucas.paz@arcadis-us.com	Investigative Organization's Consultant
Kavin Gandhi	Environmental Engineer	ARCADIS U.S., Inc.	609-860-0590, ext. 131	kavin.gandhi@arcadis-us.com	Investigative Organization's Consultant
Clifford Firstenberg	Sr. Technical Advisor	Tierra Solutions, Inc.	757-258-7720	clifford.firstenberg@tierra-inc.com	Lead Organization's Consultant
Diane Waldschmidt	Director	Environmental Data Services, Ltd.	412-486-6989	edatas@aol.com	Quality Assurance Coordinator
Greg Durell	Senior Research Scientist	Battelle	781-952-5233	durell@battelle.org	Approval Authority's Consultant
Betsy Barrows		Battelle	631-941-3213	barrowse@battelle.org	Approval Authority's Consultant
Robin Miller	Associate Scientist	HydroQual, Inc.	201-529-5151	rmiller@hydroqual.com	Approval Authority's Consultant
Amymarie Accardi-Dey	Environmental Engineer	Louis Berger Group, Inc.	914-798-3712	aaccardidey@louisberger.com	Approval Authority's Consultant
Chris Purkiss		Louis Berger Group, Inc.	973-407-1685	cpurkiss@louisberger.com	Approval Authority's Consultant
Rob Law	CPG Coordinator	de maximis, Inc.	908-735-9315	rlaw@demaximis.com	Cooperating Parties Group
Rafael Canizares	CPG Modeler	Moffatt and Nichol	212-768-7454	rcanizares@moffattnichol.com	Cooperating Parties Group
Rooni Mathew	CPG Modeler	Moffatt and Nichol	212-768-7454	rmathew@moffattnichol.com	Cooperating Parties Group

QAPP Worksheet #10
Problem Definition (Continued)

Phase I sampling will consist of collecting and analyzing samples during two precipitation events at the selected CSO (Clay Street). LSM, HSM, and whole water samples, as well as samples for metals analysis and quality assurance (QA) and quality control (QC) samples, will be generated and analyzed during each sampling event. The CSO targeted for Phase I was selected based on anticipated flow and land use to provide samples representative of the various Passaic Valley Sewerage Commissioners (PVSC) CSO districts along the lower Passaic River. Coordination with PVSC, and the City of Newark, will be necessary to facilitate access and implementation logistics. A field reconnaissance program will be completed prior to initiating CSO sample collection to plan implementation activities and confirm access to locations.

For a precipitation event to trigger mobilization for sample collection, the event must be anticipated to produce at least 0.2 inch of rain with an average intensity of at least 0.03 inch per hour with no more than 4 consecutive dry hours during the event. During anticipated storm events, the field sampling crew will coordinate/communicate with PVSC to determine the timing of regulator gate valve closing at the sampling location and appropriate time for initiating and/or mobilizing sampling equipment for sample collection. Sample collection will not be initiated until it is confirmed that the regulator gate valve has been closed and that the tide gate(s) have opened and/or that overflow to the river from the targeted CSO/SWOs is ongoing. Tierra will confirm the potential for tidal intrusion at sampling locations before sampling is initiated through review of information from PVSC and other sources, including the elevation of the sampling location and expected tidal elevation during storm and non-storm conditions. In addition, Tierra will conduct a field reconnaissance of the proposed sampling locations. During the field reconnaissance, Tierra will, in coordination with PVSC, identify sampling locations suitable for sample collection upstream of the stop logs upstream of the head of tide. Tierra will also conduct additional survey work to confirm stop log and concrete dam elevations in the regulator chambers, sampling location elevations, manhole rim elevations, and tide elevations.

During Phase I, bulk CSO effluent will be collected at the CSO location to process and generate LSM, HSM, and whole water samples. The LSM, HSM (particulate and dissolved), and whole water samples will be collected simultaneously from the same effluent stream and over the same period of time by controlling the flow rate of effluent entering each sample collection tank and the continuous flow centrifuge (CFC). Following collection of effluent into the bulk sample collection tanks, LSM samples will be collected from the whole water/LSM bulk sample collection tank and submitted to the laboratory for collection of LSM particulate and LSM dissolved samples for analysis. The effluent for collection of HSM samples will be processed via continuous flow centrifugation, with the solids retained in the CFC and elutriate collected in a collection tank. HSM particulate samples will be collected from the solids retained in the CFC, and HSM dissolved samples will be collected from the HSM dissolved bulk sample collection tank for laboratory analysis. Whole water samples will be collected from the whole water/LSM bulk sample collection tank and submitted to the laboratory for analysis. LSM, HSM, and whole water samples collected will be analyzed via the same analytical methods. Details of the LSM, HSM, and whole water sampling are provided in Worksheet #17. Standard Operating Procedures, as provided in Appendix A, will be used during implementation of Phase I sample collection. Target analytical groups for this program are consistent with other programs implemented along the lower Passaic River. LSM, HSM, whole water samples, as well as samples collected for metals analysis and QA/QC samples, will be analyzed for parameters listed in Worksheets #15-1 through #15-4. A summary of the analyses and volume requirements for samples to be collected during Phase I is included in Table 3-3.

PHASE I DATA EVALUATION AND SELECTION

Following Phase I implementation, the resulting data will be validated, evaluated, and compared to inform the selection of the sampling method that will provide the most useable and representative data for estimating contaminant concentrations in CSOs/SWOs effluent in the particulate- and dissolved-phases for each analytical group. It is critical that sufficient sample mass and/or volume be obtained during Phase I in order to accomplish the primary objective of this phase: evaluation and selection of the most appropriate sampling method for each analytical group. For this reason, an analytical hierarchy has been established ranking each analytical group based primarily upon the analytical group's importance in completing the evaluation of sampling methods to be implemented during Phase II (Worksheet #11-1). For a given sampling location, if sufficient volume is obtained to complete sampling via the three methods for all of the listed analytical groups and matrices, then samples will be collected from bulk samples generated in the sequence described in the analytical hierarchy beginning with Item Number 1 (with the exception of samples for volatile organic compound analysis, which will be collected first). The volume indicated is the minimum required to confirm sufficient material is available for each analytical group. If sufficient solids or aqueous bulk samples are not available for generating samples for all analyses or a specific sample type (e.g., HSM particulate), the analytical hierarchy will be followed to collect a subset of the analytical samples. In these instances, the analytical hierarchy will be applied to all sample types. Tierra will return to the sampling location during the next overflow event and complete the entire analytical scope beginning with the next number in the hierarchical prioritization sequence. Multiple overflow events may be needed to complete sample collection at each location. Up to three attempts will be made at each sampling location. On the third attempt, regardless of the available volumes, all remaining LSM particulate and LSM dissolved samples will be collected. During each sampling attempt, the total available volume of effluent will be noted. During sample collection, it will be noted whether enough volume would have been available to analyze the LSM sample for all analytes. However, LSM samples will be analyzed for only those constituents where HSM sample volume is also available. Some analyses (e.g., total suspended solids) will be completed during every sample attempt. USEPA will select the most appropriate sampling methods, taking into account the criteria outlined in Worksheets #11-1 and #17.

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QAPP Worksheet #11-1
Project Quality Objectives/Systematic Planning Process Statements (Phase I) (Continued)

Samples will be analyzed for contaminants that are not part of the Phase I sample collection method evaluation process (e.g., metals) in order to obtain a complete set of analytical results at the Phase I sampling location, fulfilling overall program DUOs and DQOs as outlined in Worksheet #10. The complete list of analytes that will be included in the data collection is provided in Worksheets #15-1 through #15-4.

Data evaluation will consist of a pre-screening and final evaluation step as depicted on Figure 1 – Phase I Evaluation Criteria and detailed in Worksheet #17.

WHAT TYPE OF DATA ARE NEEDED?

CSO samples will be collected from one location using three approaches: LSM, HSM, and whole water. LSM particulate, LSM dissolved, HSM particulate, HSM dissolved, and whole water samples will be generated. The resulting data will be evaluated to select the most appropriate sampling and analytical program to quantify contaminants per analyte group in the solid- (particulate), dissolved-, and whole water-phases. Worksheets #15-1 through #15-4 provide the complete list of analytes needed as part of this data collection. Standard protocols as provided for in the CSO/SWO investigation for sample collection, handling, processing, and analytical determination will be used during implementation of these tasks.

HOW MUCH DATA ARE NEEDED?

CSO effluent samples will be collected during two overflow events at Clay Street CSO location to generate LSM particulate, LSM dissolved, HSM particulate, HSM dissolved, and whole water samples for analysis. The resulting data is anticipated to be sufficient to compare and select sampling method(s) for each analyte group to be analyzed during Phase II.

HOW GOOD DO DATA NEED TO BE?

The data must be technically sound, properly documented, and validated (see Worksheets #34, #35, and #36). Project sampling and analysis activities must be consistent with the project quality objectives and reference limits (Worksheets #15-1 through #15-4).

WHEN WILL DATA BE COLLECTED?

Preparation for field collection will begin immediately upon USEPA approval of this CSO/SWO Investigation Quality Assurance Project Plan. Field sample collection will commence shortly thereafter, pending appropriate precipitation events, and is anticipated to take place in the fall of 2011.

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QAPP Worksheet #14 Summary of Project Tasks

Sampling Tasks:

The field activities include the collection and analysis of combined sewer overflow (CSO), stormwater outfall (SWO), and publicly owned treatment works (POTW) samples to characterize and quantify contaminants present in runoff discharging to the Lower Passaic River Study Area via CSO and SWO discharges and in influent to the POTW. The field sampling program will be implemented in two phases. Phase I will consist of collection and analysis of CSO samples using three approaches: low-solids mass (LSM), high-solids mass (HSM), and whole water sampling, with the objective to evaluate the most appropriate approach for each analytical group.

1. The whole water/LSM bulk sample and the HSM sample (particulate and dissolved) will be collected simultaneously from the same effluent stream. The effluent for collection of HSM samples will be processed via continuous flow centrifugation, with the solids retained in the CFC and elutriate collected in a collection tank. The collection of effluent used to generate the whole water/LSM bulk sample and HSM samples will occur over the same length of time by controlling the flow rate of effluent entering each bulk sample collection tank and CFC (see Appendix A Standard Operating Procedure- [SOP-] 3).

The LSM bulk samples will be collected from a tank (whole water/LSM bulk sample collection tank) using a peristaltic pump and Teflon® tubing and will be filtered by the laboratories to generate LSM particulate and LSM dissolved samples for analysis (see Appendix A SOP-4). The HSM particulate and dissolved samples will be generated using continuous flow centrifugation. The HSM particulate samples will be collected directly from the CFC, while the HSM dissolved samples will be collected from a tank (HSM dissolved bulk sample collection tank) using a peristaltic pump and Teflon® tubing. The whole water sample will be collected from a bulk effluent tank (whole water/LSM bulk sample collection tank) using a peristaltic pump and Teflon® tubing. Prior and during subsampling activities to beginning grab subsampling activities from the whole water/LSM bulk sample collection tank or HSM dissolved bulk sample collection tank, a stainless steel mixer will be used to mix the bulk sample. Additional grab samples for metals analysis (whole water and dissolved metals), as well as total suspended solids (TSS)/total dissolved solids (TDS) samples, will be collected as grab whole water/dissolved samples. Metals sample collection activities implemented during the CSO/SWO program will be performed following procedures outlined in Method 1669 Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels (U.S. Environmental Protection Agency [USEPA] 1996) using a peristaltic pump and Teflon® tubing. Samples collected for dissolved metals analyses will be filtered in the field. Efforts will be made to ship the samples collected for both total and dissolved metals analysis to the analytical laboratory via overnight carrier on the same day they are collected (contingent on time of sample collection) and preserved at the off-site laboratory location within 48 hours of collection. During collection of bulk effluent, grab whole water samples will be collected periodically for analysis of TSS and TDS.

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2. Phase II will consist of collection and analysis of samples from target CSO, SWO, and POTW locations using the sampling and analytical procedures selected following evaluation of Phase I results. Details of field sampling procedures, including sampling documentation and decontamination processes are provided in Appendix A (Field SOPs).

Analysis Tasks:

Laboratory	Analyte	Analysis Task
TestAmerica Burlington, VT	semivolatile organics, semivolatile organics (select ion monitoring), Aroclor polychlorinated biphenyls (PCBs), and chlorinated herbicides	LSM particulate, LSM dissolved, HSM particulate, HSM dissolved, and whole water samples
	volatile organics, total extractable petroleum hydrocarbon, and cyanide	HSM particulate, HSM dissolved, and whole water samples
	total suspended solids and total dissolved solids	LSM dissolved, HSM dissolved, whole water, and grab whole water samples
	total organic carbon	HSM particulate and whole water samples
	particulate organic carbon	LSM particulate samples
	dissolved organic carbon	LSM dissolved and HSM dissolved samples
	grain size	whole water samples
	polychlorinated dibenzo- <i>p</i> -dioxins/polychlorinated dibenzofurans, PCB congeners, and organochlorine pesticides	LSM particulate, LSM dissolved, HSM particulate, HSM dissolved, and whole water samples
Vista Analytical	Target Analyte List metals, titanium, mercury, and methylmercury	whole water, grab whole water, and grab dissolved samples
Brooks Rand Labs		

QAPP Worksheet #17
Sampling Design and Rationale

OVERVIEW

The combined sewer overflow/stormwater outfall (CSO/SWO) investigation involves the collection of aqueous and suspended solids samples from CSOs, SWOs, and publically owned treatment works (POTWs) to provide data regarding the types and concentrations of contaminants that are discharged to the Lower Passaic River Study Area (LPRSA) from CSO/SWO releases. Details of the sampling design are derived from the U.S. Environmental Protection Agency (USEPA) Combined Sewer Overflow/Stormwater Overflow Sampling and Analytical Plan, Revision No. 2.0, August 2008 (CSO/SWO S&AP) and subsequent discussions between USEPA and Tierra Solutions, Inc. (Tierra). USEPA has agreed to allow Tierra to conduct the CSO/SWO investigation under USEPA oversight. Tierra has developed this CSO/SWO Investigation Quality Assurance Project Plan (QAPP) to implement the program. Additional information can be found in the Summary and Worksheet #10.

The investigation will be conducted in two phases, with the initial phase consisting of collection and analysis of two CSO samples using three sampling approaches to evaluate the most appropriate sample collection techniques to use for each analytical group in Phase II. During Phase II of the investigation, representative CSO and SWO locations will be sampled during two discrete precipitation events. A total of nine CSO and 10 SWO locations, prescribed in the CSO/SWO S&AP, will be targeted during this investigation. In addition, four time-integrated POTW samples will be collected on a quarterly basis for 1 year. Sample locations are detailed in Worksheets #18-1 and #18-2. The CSO locations selected for Phase I and Phase II sampling are based on locations prescribed in the CSO/SWO S&AP and are representative of various land uses (commercial/industrial, and residential), drainage area sizes, and based upon historical observed maximum discharge to the Passaic River and anticipated overflow volume and frequency. The proposed CSO locations have been sampled in the past under other sampling programs. Prior to Phase II implementation, Tierra will further evaluate SWOs and associated watersheds to confirm that the 10 proposed SWO sample locations are representative of the SWO discharges from the land use types. Tierra will perform a field reconnaissance of the proposed CSO and SWO locations prior to implementation. Sampling locations may be modified pending further evaluation of information provided on the integrated landside models (RAINMAN, Stormwater Management Model, InfoWorks) and the findings of a field reconnaissance. Modifications to proposed sampling locations will not be made without USEPA approval.

For a precipitation event to trigger mobilization for sample collection, the event must be anticipated to produce at least 0.2 inches of rain with an average intensity of at least 0.03 inches per hour with no more than 4 consecutive dry hours during the event. During anticipated storm events, the field sampling crew will coordinate/communicate with PVSC to determine the timing of regulator gate valve closing at the sampling location and appropriate time for initiating and/or mobilizing sampling equipment for sample collection. Sample collection will not be initiated until it is confirmed that the regulator gate valve has been closed and that the tide gate(s) have opened and/or that overflow to the river from the targeted CSO/SWOs is ongoing. Tierra will confirm the potential for tidal intrusion at sampling locations before sampling is initiated through review of information from Passaic Valley Sewerage Commissioners (PVSC) and other sources, including the elevation of the sampling location and expected tidal elevation during storm and non-storm conditions. In addition, Tierra will conduct a field reconnaissance of the proposed sampling locations. During the field reconnaissance, Tierra will, in coordination with PVSC, identify sampling locations suitable for sample collection upstream of the stop logs upstream of the head of tide. Tierra will also conduct additional survey work to confirm stop log and concrete dam elevations in the regulator chambers, sampling location elevations, manhole rim elevations, and tide elevations.

PHASE I

The CSO targeted for Phase I (Clay Street) was selected based on anticipated flow and land use to provide samples representative of the various PVSC CSO districts along the lower Passaic River. Additional data regarding this location is presented in the Summary and in supporting tables and on figures.

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QAPP Worksheet #17
Sampling Design and Rationale (Continued)

There is a wide array of contaminants of interest to be evaluated in this investigation. As a result of highly variable physiochemical properties, the partitioning of the contaminants between the dissolved- and particulate- (attached to the suspended sediment) phases will also vary widely. Some hydrophobic contaminants are anticipated to be present in extremely low concentrations, requiring greater mass of particulates to achieve quantifiable concentrations. Various sampling, handling, and analytical techniques exist to achieve the higher mass required for quantitation. Phase I consists of the collection and analysis of CSO samples using three approaches: low-solids mass (LSM), high-solids mass (HSM), and whole water. LSM and HSM use different methods to separate the aqueous (dissolved) and particulate (suspended particle) matrices. Samples for metals analysis (whole water and dissolved) will be collected as grab samples following procedures outlined in Method 1669 Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels (USEPA 1996). Metals samples will be collected in accordance with protocols provided in Standard Operating Procedure- (SOP-) 5.

The LSM approach was proposed in the CSO/SWO S&AP and has been implemented and modified in historical programs, such as the 1998-2004 Contaminant Assessment and Reduction Program (CARP; Great Lakes Environmental Center [GLEC] 2008) and the 2008 USEPA CSO/SWO solid-phase sampling conducted by Malcolm Pirnie Inc. (2008). The LSM approach uses slightly larger sample volumes than typically used, and particulates are isolated by filtration.

The HSM approach was proposed in the Passaic River Study Area, CSO Investigation Work Plan/Field Sampling Plan Revision No. 1 (Tierra 2002), but not approved by USEPA. HSM uses a significantly larger volume of effluent to harvest sufficient particulates separated by continuous flow centrifugation. The range in volumes potentially required for the HSM method have been estimated based on the range of total suspended solids (TSS) concentrations expected and mass of particulates required for analysis.

The side-by-side sampling completed during Phase I of the CSO/SWO investigation will consist of collecting and analyzing samples generated using each method at the Clay Street CSO location. From an initial single sample flow stream, flow will be continuously diverted to a Teflon[®]-lined tank to hold bulk effluent water (to generate the LSM and whole water samples) and a CFC (to generate solids for HSM analysis and CFC effluent for dissolved-phase analysis). The CFC effluent will be held in a Teflon[®]-lined tank. A sample withdrawal port will be used to obtain whole water TSS/total dissolved solids grab samples during collection of effluent to obtain instantaneous measurements during collection of bulk effluent. Samples for metals, mercury, and methylmercury analyses will be collected directly from the effluent stream following procedures outlined in Method 1669 Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels (USEPA 1996). Data collected during Phase I will be used to select the most appropriate sampling program for quantifying constituents of concern in the solid-(particulate) and dissolved-phases during the second phase of the program.

During the bulk effluent collection, selected physiochemical water quality parameters will be measured, water depth will be measured at the location of the sample intake tubing, and flow data will be collected. Physiochemical parameters will include conductivity (salinity), temperature, and turbidity. All probes and measurement devices will be chosen according to site-specific conditions, as well as the requirements established in the attached SOPs. All field instrumentation will be calibrated and maintained in accordance with manufacturers' specifications.

Target analyte groups for the Phase I analytical program are consistent with other programs implemented along the lower Passaic River. Worksheet #18-1 details the list of analytical groups for each sample. If a sufficient mass of particulates is not obtained for analyses of all the target analytical groups, a hierarchical order of analyses for particulate samples will be followed (Worksheet #11-1). The method detection and quantitation limits for each specific parameter to be included in the analyses are summarized in Worksheets #15-1 through #15-4.

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QAPP Worksheet #17
Sampling Design and Rationale (Continued)

During the final evaluation steps, results obtained for a given analytical group using LSM, HSM or whole water sample collection methods (as appropriate) will be compared directly. If for a given analyte group, one sample collection method produces a significantly larger (greater than 10%) number of positive target analyte values and/or a significantly larger (greater than 10%) number of positive results for analytes that are COPCs listed in the FFS, then that sample collection method will be identified as the preferred sample collection method for that particular analytical group, and therefore, will be selected as the sample collection method used during implementation of Phase II.

This program will not attempt to rank relative importance of the COPCs listed in the FFS, but rather, will simply recognize them as such during comparison of numbers of positive detections observed for each sample collection method/analyte group, preferring a method demonstrating more positive results detected in this category. The one exception to this statement are those target analytes assigned a Toxicity Equivalency Factor (TEF) by the World Health Organization (WHO). Because the relevant toxicity of these compounds has been established and is reflected in the TEF value, the TEF will be considered during comparison of positive detections reported. Specifically, analytes detected that are associated with a higher TEF factor can be used to support program DUOs/DQOs to a larger degree, and therefore, will be preferred during the sample collection method evaluation and selection.

USEPA will make the final selection of methods.

PHASE II

Phase II will consist of sampling at the remaining prescribed ~~eight~~ CSOs, 10 SWOs, and one POTW locations proposed in the CSO/SWO S&AP (USEPA 2008). A field reconnaissance will be performed before the start of field activities to confirm access to sample locations. The CSO, SWO, and POTW locations selected for Phase II will also be evaluated to confirm that they are consistent with subsequent runoff modeling that will be performed. The remaining ~~eight~~ target CSOs are those that have a high frequency of overflow events and/or have relatively large drainage areas. The SWO locations prescribed in the CSO/SWO S&AP are based upon expected volumes or past successes (CARP and USEPA 2008) in sampling at these locations. Each CSO and SWO will be sampled during two discrete precipitation events. The Phase II target CSO, SWO, and POTW locations are listed in Worksheet #18-2.

During Phase II, POTW influent samples of sanitary sewage are to be collected as 24-hour composite samples using an automatic ISCO, or equivalent, automatic water sampler. Details of the sample collection procedure for this activity will be provided in an addendum after completion of Phase I sampling and selection of Phase II sampling methods.

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QAPP Worksheet #18-1
Sampling Locations and Methods/SOP Requirements (Phase I)

Sampling Location/ID Number ^a	Matrix	Analytical Group	Concentration Level	Number of Samples ^b	Sampling SOP Reference	Rationale for Sampling Location
Clay Street PR1CSQCLYWW-01A	Whole water	PCDD/PCDFs, PCB Congeners, Organochlorine Pesticides, Aroclor PCBs, Semivolatile Organics, Semivolatile Organics (SIM), Volatile Organics, Chlorinated Herbicides, Cyanide, TEPH, TOC, Grain Size, TSS, TDS, Metals, Mercury, Methylmercury	Low	1	SOP-3, SOP-4	See Worksheet #17
Clay Street PR1CSQCLYGW-01A ^a	Grab sample whole water	Metals, Mercury, Methylmercury, TSS/TDS	Low	1	SOP-5	See Worksheet #17
Clay Street PR1CSQCLYGD-01A	Grab sample dissolved	Metals, Mercury, Methylmercury	Low	1	SOP-5	See Worksheet #17
Clay Street PR1CSQCLYLD-01A ^a	LSM dissolved	PCDD/PCDFs, PCB Congeners, Organochlorine Pesticides, Aroclor PCBs, Semivolatile Organics, Semivolatile Organics (SIM), Chlorinated Herbicides, DOC, TSS, TDS	Low	1	SOP-3, SOP-4	See Worksheet #17
Clay Street PR1CSQCLYLP-01A ^a	LSM particulate	PCDD/PCDFs, PCB Congeners, Organochlorine Pesticides, Aroclor PCBs, Semivolatile Organics, Semivolatile Organics (SIM), Chlorinated Herbicides, POC	Low	1	SOP-3, SOP-4	See Worksheet #17
Clay Street PR1CSQCLYHD-01A	HSM dissolved	PCDD/PCDFs, PCB Congeners, Organochlorine Pesticides, Aroclor PCBs, Semivolatile Organics, Semivolatile Organics (SIM), Volatile Organics, Chlorinated Herbicides, Cyanide, TEPH, DOC, TSS, TDS	Low	1	SOP-3, SOP-4	See Worksheet #17
Clay Street PR1CSQCLYHP-01A ^a	HSM particulate	PCDD/PCDFs, PCB Congeners, Organochlorine Pesticides, Aroclor PCBs, Semivolatile Organics, Semivolatile Organics (SIM), Volatile Organics, Chlorinated Herbicides, Cyanide, TEPH, TOC	Low	1	SOP-3, SOP-4	See Worksheet #17

See the last page of Worksheet #18-1 for footnotes.

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QAPP Worksheet #18-1
Sampling Locations and Methods/SOP Requirements (Phase I) (Continued)

Sampling Location/ID Number ^a	Matrix	Analytical Group	Concentration Level	Number of Samples ^b	Sampling SOP Reference	Rationale for Sampling Location
Clay Street PR1CSOCLYWW-02A ^a	Whole water	PCDD/PCDFs, PCB Congeners, Organochlorine Pesticides, Aroclor PCBs, Semivolatile Organics, Semivolatile Organics (SIM), Volatile Organics, Chlorinated Herbicides, Cyanide, TEPH, TOC, Grain Size, TSS, TDS, Metals, Mercury, Methylmercury	Low	1	SOP-3, SOP-4	See Worksheet #17
Clay Street PR1CSOCLYGW-02A ^a	Grab sample whole water	Metals, Mercury, Methylmercury, TSS/TDS	Low	1	SOP-5	See Worksheet #17
Clay Street PR1CSOCLYGD-02A ^a	Grab sample dissolved	Metals, Mercury, Methylmercury	Low	1	SOP-5	See Worksheet #17
Clay Street PR1CSOCLYLD-02A ^d	LSM dissolved	PCDD/PCDFs, PCB Congeners, Organochlorine Pesticides, Aroclor PCBs, Semivolatile Organics, Semivolatile Organics (SIM), Chlorinated Herbicides, DOC, TSS, TDS	Low	1	SOP-3, SOP-4	See Worksheet #17
Clay Street PR1CSOCLYLP-02A ^d	LSM particulate	PCDD/PCDFs, PCB Congeners, Organochlorine Pesticides, Aroclor PCBs, Semivolatile Organics, Semivolatile Organics (SIM), Chlorinated Herbicides, POC	Low	1	SOP-3, SOP-4	See Worksheet #17
Clay Street PR1CSOCLYHD-02A ^a	HSM dissolved	PCDD/PCDFs, PCB Congeners, Organochlorine Pesticides, Aroclor PCBs, Semivolatile Organics, Semivolatile Organics (SIM), Volatile Organics, Chlorinated Herbicides, Cyanide, TEPH, DOC, TSS, TDS	Low	1	SOP-3, SOP-4	See Worksheet #17
Clay Street PR1CSOCLYHP-02A ^a	HSM particulate	PCDD/PCDFs, PCB Congeners, Organochlorine Pesticides, Aroclor PCBs, Semivolatile Organics, Semivolatile Organics (SIM), Chlorinated Herbicides, Cyanide, TEPH, TOC	Low	1	SOP-3, SOP-4	See Worksheet #17
Clay Street PR1CSOCLYHP-02A1 ^f	HSM particulate (fine material)	Volatile Organics	Low	1	SOP-3, SOP-4	See Worksheet #17
Clay Street PR1CSOCLYHP-02A2 ^f	HSM particulate (non-fine paper-like material)	Volatile Organics	Low	1	SOP-3, SOP-4	See Worksheet #17

See the last page of Worksheet #18-1 for footnotes.

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QAPP Worksheet #18-1
Sampling Locations and Methods/SOP Requirements (Phase I) (Continued)

- Notes:
- ^a CSO effluent samples will be collected from a manhole downstream of the CSO regulator and upstream of the tide gate (final sampling location will be established based on field reconnaissance).
 - ^b In addition to the number of samples listed, a field duplicate will be collected at a frequency of one per sample delivery group not to exceed one per 20 samples per matrix per method.
 - ^c TSS/TDS samples of the bulk CSO/SWO effluent will be collected during the course of the sampling event. It is assumed a total of eight samples will be collected, one sample approximately every 30 minutes for 4 hours. If the sampling event is longer than 4 hours, additional samples may be collected. Additional samples will be numbered sequentially from -09 to -99.
 - ^d LSM bulk material will be assigned an interim identification code for transporting the LSM bulk sample to the laboratory. Once at the laboratory, the LSM bulk material will be filtered in accordance with SOP No. L-24 – LSM Bulk Sample Filtration, to generate LSM particulate and LSM dissolved samples for analysis.
 - ^e The sample identification code will have one character to describe the sampling attempt. "A" will be used for the first attempt, "B" for the second attempt, and "C" for a third attempt. Refer to SOP 8 for sample identification codes.
 - ^f In the event that two different type/size of solids are recovered in the CFC bowl, samples will be collected for both type of solids and analyzed for volatile organics. The sample identification code will have one character to describe the HSM particulate fractions that may be encountered (e.g., fine material and non-fine material). "1" will be used for the fine fraction and "2" will be used for the non-fine (e.g., paper-like) fraction. Refer to SOP 8 for sample identification codes. A physical description of the fractions will be recorded in accordance with SOP 7.

CSO = combined sewer overflow
DOC = dissolved organic carbon
HSM = high-solids mass
LSM = low-solids mass
PCB = polychlorinated biphenyl
PCDD = polychlorinated dibenzo-*p*-dioxin
PCDF = polychlorinated dibenzofuran
POC = particulate organic carbon
SIM = selected ion monitoring
SOP = Standard Operating Procedure
SWO = stormwater outfall
TDS = total dissolved solid
TEPH = total extractable petroleum hydrocarbon
TOC = total organic carbon
TSS = total suspended solid

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QAPP Worksheet #18-2
Sampling Locations and Methods/SOP Requirements (Phase II)

Sampling Location/ID Number	Matrix ^a	Analytical Group ^a	Concentration Level	Number of Samples ^{a,c}	Sampling SOP Reference	Rationale for Sampling Location
Ivy Street PR2CSOIVYWW-01	Whole water	TBD	Low	1	SOP-3, SOP-4	See Worksheet #17
Ivy Street PR2CSOIVYGW-01	Grab sample whole water	Metals, Mercury, Methylmercury	Low	1	SOP-5	See Worksheet #17
Ivy Street PR2CSOIVYGD-01	Grab sample dissolved	Metals, Mercury, Methylmercury	Low	1	SOP-5	See Worksheet #17
Ivy Street PR2CSOIVYLD-01 ^d	LSM dissolved	TBD	Low	1	SOP-4	See Worksheet #17
Ivy Street PR2CSOIVYLP-01 ^d	LSM particulate	TBD	Low	1	SOP-3, SOP-4	See Worksheet #17
Ivy Street PR2CSOIVYHD-01	HSM dissolved	TBD	Low	1	SOP-3, SOP-4	See Worksheet #17
Ivy Street PR2CSOIVYHP-01	HSM particulate	TBD	Low	1	SOP-3, SOP-4	See Worksheet #17
Ivy Street PR2CSOIVYWW-02	Whole water	TBD	Low	1	SOP-3, SOP-4	See Worksheet #17
Ivy Street PR2CSOIVYGW-02	Grab sample whole water	Metals, Mercury, Methylmercury	Low	1	SOP-5	See Worksheet #17
Ivy Street PR2CSOIVYGD-02	Grab sample dissolved	Metals, Mercury, Methylmercury	Low	1	SOP-5	See Worksheet #17
Ivy Street PR2CSOIVYLD-02 ^d	LSM dissolved	TBD	Low	1	SOP-4	See Worksheet #17
Ivy Street PR2CSOIVYLP-02 ^d	LSM particulate	TBD	Low	1	SOP-3, SOP-4	See Worksheet #17
Ivy Street PR2CSOIVYHD-02	HSM dissolved	TBD	Low	1	SOP-3, SOP-4	See Worksheet #17
Ivy Street PR2CSOIVYHP-02	HSM particulate	TBD	Low	1	SOP-3, SOP-4	See Worksheet #17

See the last page of Worksheet #18-2 for footnotes.

QAPP Worksheet #18-2
Sampling Locations and Methods/SOP Requirements (Phase II) (Continued)

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See the last page of Worksheet #18-2 for footnotes.

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QAPP Worksheet #19-1
Analytical SOP Requirements – Water^a

Notes:

- ^a Water matrices include HSM dissolved, whole water, LSM dissolved, grab sample whole water, grab sample dissolved, and field/rinsate/equipment blanks.
- ^b Analytical methods are as specified in Worksheet #23-1.
- ^c These are minimum sample volume requirements for a single sample analysis. Extra volume will be needed in order to fulfill quality control sample requirements, such as matrix spike/matrix spike duplicate and/or to provide contingency volume for analysis or breakage.
- ^d Samples for analyses having identical container and preservation requirements may be combined in the same container. Similarly, smaller- or larger-sized sample containers than those recommended here may be used as long as the quality, container material, and preservative specifications are met, and the containers or container used will hold sufficient mass/volume to meet the minimum requirements specified.
- ^e Holding time is calculated from the date and time of sample collection, to the date and time of sample analysis (or extraction as noted).
- ^f Maximum holding times listed are based upon those stipulated in corresponding data validation guidance located in Appendix C of this CSO/SWO Investigation Quality Assurance Project Plan.
- ^g All water samples will be field tested for the presence of residual chlorine using appropriate test strips. If residual chlorine is determined to be present in a given sample, the sample will be further preserved by the addition of sodium thiosulfate to a concentration of 0.008 percent. See SOP-8 for details.
- ^h Volatile organics are analyzed at the trace level in water matrices.
- ⁱ Specifications apply to both total and dissolved analyses (post-separation).
- ^j Samples will be shipped at 4°C to the laboratory via overnight carrier on the day after bulk sample collection. Preservation will occur at the laboratory within the specified holding time (immediately upon receipt) in order to minimize the sources of potential field contamination. Sample will be stored for a minimum of 48 hours at 4°C after preservation and prior to analysis to allow the acid to completely dissolve the metals adsorbed on the container walls.

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°C = degrees Celsius
BrCl = bromine chloride
CSO = combined sewer overflow
G = amber glass
P = plastic
H₂SO₄ = sulfuric acid
HCl = hydrochloric acid
HNO₃ = nitric acid
HSM = high-solids mass
L = liter
LSM = low-solids mass
mL = milliliters
NaOH = sodium hydroxide
PCBs = polychlorinated biphenyls
PCDD/PCDFs = polychlorinated dibenzo-*p*-dioxins/polychlorinated dibenzofurans
SIM = selective ion monitoring
SOP = Standard Operating Procedure
SWO = stormwater outfall
TDS = total dissolved solids
TEPH = total extractable petroleum hydrocarbons
TOC = total organic carbon
TSS = total suspended solids

QAPP Worksheet #19-2
Analytical SOP Requirements – HSM Particulate

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference ^a	Sample Mass (g) ^b	Containers (number and type) ^c	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/analysis) ^{d,e}
HSM Particulate	Volatile Organics ^f	Low	L-1	15	3x (5 g) Encore™ Sampler, or equivalent	4°C	48 hours to extraction, 12 days until analysis
HSM Particulate	Semivolatile Organics	Low	L-1	30	4 (16 oz) G ^{g,h}	4°C	7 days to extraction, 40 days until analysis
HSM Particulate	Aroclor PCBs	Low	L-1	30			7 days to extraction, 40 days until analysis
HSM Particulate	Chlorinated Herbicides	Low	L-10	50			14 days to extraction, 40 days until analysis
HSM Particulate	TOC	Low	L-11	10			14 days
HSM Particulate	TEPH	Low	L-13	30			14 days to extraction, 40 days until analysis
HSM Particulate	Semivolatile Organics (SIM)	Low	L-1	30	8.8 oz. G ⁱ	4°C	7 days to extraction, 40 days until analysis
HSM Particulate	Cyanide	Low	L-7	5			14 days
HSM Particulate	Organochlorine Pesticides	Low	L-2, L-26	10			7 days to extraction, 40 days until analysis
HSM Particulate	PCDD/PCDFs	Low	L-8	10			30 days to extraction, 45 days until analysis
HSM Particulate	PCB Congeners	Low	L-9	10			30 days to extraction, 40 days until analysis

Notes:

^a Analytical methods are as specified in Worksheet #23.

^b These are minimum sample mass requirements for a single sample analysis. Extra mass/volume will be needed in order to fulfill quality control sample requirements, such as matrix spike/matrix spike duplicate and/or to provide contingency mass/volume for re-analysis or breakage.

^c Samples for analyses having identical container and preservation requirements may be combined in the same container. Similarly, smaller- or larger-sized sample containers than those recommended here may be used as long as the quality, container material, and preservative specifications are met, and the containers or container used will hold sufficient mass/volume to meet the minimum requirements specified.

^d Holding time is calculated from the date and time of sample collection, to the date and time of sample analysis (or extraction as noted).

^e Maximum holding times listed are based upon those stipulated in corresponding data validation guidance located in Appendix C of this Combined Sewer Overflow/Stormwater Outfall Investigation Quality Assurance Project Plan.

^f A separate Percent Moisture sample must be collected with the VOCs per USEPA Contract Laboratory Program SOM01.2. These will also be collected in Encore™ samples. If insufficient solids are collected to use Encore™ samplers directly, the sampling crew will use a stainless steel spoon or spatula to fill the Encore™ samplers in accordance with SOP-4. All Encore™ samplers must contain zero headspace after sample collection. In the event that two different type/size of solids (fine and non-fine or paper-like material) are recovered in the CFC bowl, samples will be collected of both type of HSM Particulate solids and analyzed for volatile organics.

^g Short, wide-mouth jars with Teflon™-lined lids.

^h Semivolatile organics, Aroclor PCB, cyanide, chlorinated herbicides, TOC, and TEPH can all be combined in the same (four) 16-oz containers.

ⁱ Organochlorine Pesticides, PCDD/PCDFs and Congener PCBs can all be combined in the same 8.8-oz container.

^j PCDD/PCDFs = polychlorinated dibenzo-p-dioxins and dibenzofurans

^k TOC = total organic carbon

^l VOCs = volatile organic compounds

^m USEPA = U.S. Environmental Protection Agency

ⁿ SIM = selective ion monitoring

^o SOP = Standard Operating Procedure

^p TEPH = total extractable petroleum hydrocarbons

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QAPP Worksheet #20-1b
HSM Particulate Field Quality Control Sample Summary (Phase I)^a

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference ^b	Number of Samples Collected	Number of Field Duplicate Pairs	Number of MS ^c	Number of MSD or Duplicates ^c	Number of Trip Blanks	Number of Rinse/Field Blanks ^d	Total Number of Samples to Lab ^e
HSM Particulate	Semivolatile Organics	Low	L-1	2	1	1	1	NA	2	5
HSM Particulate	Volatile Organics ^f	Low	L-1	2	1	1	1	2	2	7
HSM-Particulate	Aroclor PCBs	Low	L-1	2	1	1	1	NA	2	5
HSM Particulate	Organochlorine Pesticides	Low	L-2, L-26	2	1	1	1	NA	2	5
HSM Particulate	Semivolatile Organics (SIM)	Low	L-1	2	1	1	1	NA	2	5
HSM Particulate	Cyanide	Low	L-7	2	1	1	1	NA	2	5
HSM Particulate	PCDD/PCDFs	Low	L-8	2	1	1	1	NA	2	5
HSM Particulate	PCB Congeners	Low	L-9	2	1	1	1	NA	2	5
HSM Particulate	Chlorinated Herbicides	Low	L-10	2	1	1	1	NA	2	5
HSM Particulate	TOC	Low	L-11	2	1	1	1	NA	2	5
HSM Particulate	TEPH	Low	L-13	2	1	1	1	NA	2	5

Notes:

- ^a Laboratory performance evaluation (PE) samples are part of the planned project quality control program. However, those samples are not listed here, as these quality control samples will be administered separately from the field sample collection control tasks.
- ^b Referenced from the Analytical SOP References Table (Worksheet #23).
- ^c Assumes MS/MSD will be collected at a rate of one (MS) and one (MSD) per up to 20 samples or per SDG (whichever is more frequent) for all constituents, except cyanide, which will have one MS and laboratory duplicate per up to 20 samples collected or per SDG, whichever is more frequent.
- ^d Field blanks will be applied to both HSM particulate and dissolved-phases. Field blank numbers listed are those that are associated with a given sample. However, because field blanks are shared between various sample collection techniques in Phase I, this value may not represent the actual number of field blanks collected or sent to the laboratories.
- ^e This value excludes rinse/field blanks.
- ^f In the event that two different type/size of solids (fine and non-fine or paper-like material) are recovered in the CFC bowl, samples will be collected for both type of HSM Particulate solids and analyzed for volatile organics.

HSM = high-solids mass
MS = matrix spike
MSD = matrix spike duplicate
NA = not applicable
PCBs = polychlorinated biphenyls
PCDD/PCDFs = polychlorinated dibenzo-*p*-dioxins and dibenzofurans
SDG = sample delivery group
SIM = selective ion monitoring
SOP = Standard Operating Procedure
TEPH = total extractable petroleum hydrocarbons
TOC = total organic carbon

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QAPP Worksheet #20-2b
Particulate Field Quality Control Sample Summary (Phase II)^{a,b}

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference ^c	Number of Samples Collected	Number of Field Duplicate Pairs	Number of MS ^d	Number of MSD or Duplicates ^d	Number of Trip Blanks ^d	Number of Field, Rinse, and Equipment Blanks ^e	Total Number of Samples to Lab ^f
Particulate	Semivolatile Organics	Low	L-1	40	2	20	20	NA	TBD	82
Particulate	Volatile Organics ^h	Low	L-1	40	2	20	20	20	TBD	102
Particulate	Aroclor PCBs	Low	L-1	40	2	20	20	NA	TBD	82
Particulate	Semivolatile Organics (SIM)	Low	L-1	40	2	20	20	NA	TBD	82
Particulate	Organochlorine Pesticides	Low	L-2	40	2	20	20	NA	TBD	82
Particulate	Cyanide	Low	L-7	40	2	20	20	NA	TBD	82
Particulate	PCDD/PCDFs	Low	L-8	40	2	20	20	NA	TBD	82
Particulate	PCB Congeners	Low	L-9	40	2	20	20	NA	TBD	82
Particulate	Chlorinated Herbicides	Low	L-10	40	2	20	20	NA	TBD	82
Particulate	TOC	Low	L-11	40	2	20	20	NA	TBD	82
Particulate	TEPH	Low	L-13	40	2	20	20	NA	TBD	82

Notes:

^a The number of samples to be collected, as well as the number of associated quality control samples are estimates. These numbers may change depending upon the sampling technique selected for a given analytical group during the Phase I evaluation task.

^b Laboratory performance evaluation (PE) samples are part of the planned project quality control program. However, those samples are not listed here, as these quality control samples will be administered separately from the field sample collection control tasks.

^c Referenced from the Analytical SOP References Table (Worksheet #23). Analytical and preparation method/SOPs for Phase II will be determined upon evaluation of Phase I results.

^d Assumes two samples per SDG/batch. Actual number of samples in an SDG may vary based on field conditions. A minimum of one (MS) and one (MSD) per up to 20 samples or per SDG (whichever is more frequent) for all constituents, except cyanide, which will have one MS and one laboratory duplicate per SDG (up to 20 samples). Likewise, a minimum of one trip blank will be collected for each shipment containing samples for volatile analysis.

^e Phase II sample collection techniques will be selected after the evaluation of results obtained during Phase I. A number of field, rinse, and equipment blanks will vary depending upon the sample collection technique selected after evaluation of results obtained during Phase I. However, the following field, rinse, and equipment blank frequencies will be applied when the sampling techniques specified below are employed:

Sampling Technique	Number of Rinse/Equipment Blanks
Whole Water	2
HSM Particulate/Dissolved	3 pre-project, remaining 1 additional per decontamination event not to exceed 1 per day
LSM Particulate/Dissolved	3
Dissolved (Metals)	1
TSS/TDS	1

^f This value excludes rinse/equipment blanks.

^g In the event that two different type/size of solids (fine and non-fine or paper-like material) are recovered in the CFC bowl, samples will be collected for both type of HSM Particulate solids and analyzed for volatile organics.

HSM = high-solids mass
LSM = low-solids mass
MS = matrix spike
MSD = matrix spike duplicate
NA = not applicable

PCBs = polychlorinated biphenyls
PCDD/PCDFs = polychlorinated dibenzo-*p*-dioxins and dibenzofurans
SDG = sample delivery group
SIM = selective ion monitoring
SOP = Standard Operating Procedure

TDS = total dissolved solids
TEPH = total extractable petroleum hydrocarbons
TOC = total organic carbon
TSS = total suspended solids

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QAPP Worksheet #22
Field Equipment Calibration, Maintenance, Testing, and Inspection

Field Equipment	Calibration Activity	Maintenance Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference ^{a,b}
Differential global positioning system, global positioning system	NA	Replace batteries (as needed)	Check for damage, check batteries	Daily prior to use	Per manufacturer's instructions	Replace batteries; replacement/backup GPS available on site or shipped overnight	Field Supervisor	SOP-1
Multi-parameter water quality meter	Per manufacturer's instructions	Per manufacturer's instructions	Check for damage, check batteries	Daily prior to use	Calibration limits per manufacturer's instructions ^c	Replace batteries; replacement/backup water quality meter available on site	Field Supervisor	SOP-3
Stopwatch	NA	Per manufacturer's instructions	Check for damage, check batteries	Daily prior to use	Per manufacturer's instructions	Replacement/backup stopwatch available on site or shipped overnight	Field Supervisor	SOP-3
Refrigerator, walk-in cooler, or refrigerated truck	NA	Per manufacturer's instructions	Check for damage	Daily prior to use	Per manufacturer's instructions	Obtain sufficient ice and coolers available on site for keeping samples refrigerated	Field Supervisor	SOP-3, SOP-4, SOP-5
Five-gas analyzer	Per manufacturer's instructions	Replace batteries (as needed); Replace lamp	Check for damage, check batteries or power source	Daily prior to use	Calibration limits per manufacturer's instructions	Replace batteries; replacement/backup PID available on site or shipped overnight	Field Supervisor	SOP 1, SOP-3, SOP-4, SOP-5
Feed pump, peristaltic pump	NA	Per manufacturer's instructions	Check for damage	Daily prior to use	Per manufacturer's instructions	Replacement/backup pump(s) available on site	Field Supervisor, Laboratory Project Manager	SOP-3, SOP-4, SOP-5

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See the last page of Worksheet #22 for a description of footnotes.

QAPP Worksheet #22
Field Equipment Calibration, Maintenance, Testing, and Inspection (Continued)

Field Equipment	Calibration Activity	Maintenance Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference ^{a,b}
Continuous Flow centrifuge (CFC)	NA	Per manufacturer's instructions	Check for damage, check power source	Daily prior to use	Per manufacturer's instructions	Stop work if equipment is unfit for use; replace/fix CFC prior to resuming sampling activities	Field Supervisor	SOP-3
Flow meter	Per manufacturer's instruction	Per manufacturer's instructions	Check for damage	Daily prior to use	Per manufacturer's instructions	Replacement/backup flow meter available on site or shipped overnight	Field Supervisor	SOP-3
Analytical balance (small and large capacity) ^c	Per manufacturer's instruction	Per manufacturer's instructions	Check for damage, check batteries	Daily prior to use	Calibration limits and accuracy using calibration weights and per manufacturer's instructions	Stop work if equipment is unfit for use; replace batteries and/or replacement/backup available onsite	Field Supervisor	SOP-4
Camera	NA	Per manufacturer's instructions; Replace batteries (as needed)	Check for damage, check batteries	Daily prior to use	Per manufacturer's instructions	Replace batteries; replacement/backup camera available onsite	Field Supervisor	SOP-1, SOP-2, SOP-3, SOP-4, SOP-5
Truck trailer	NA	Per manufacturer's instructions	Check for damage using Daily trailer inspection list (HASP)	Daily prior to use	See daily trailer inspection list	Stop work if equipment is unfit for use; Fix prior to use	Field Supervisor	SOP-3

Notes:

^a From the Project Sampling SOP References Table (Worksheet #21).

^b In all instances where an SOP will be utilized, a hard copy or electronic version will be available at the point of use.

^c Calibration limits for multi-parameter water quality meter (e.g., Horiba or equivalent) are as follows: conductivity – $\pm 0.5\%$; temperature – ± 0.5 degrees Celsius; turbidity – $\pm 0.5\%$.

^d Calibration limits for small and large capacity are to be as per manufacturer specifications. The balances will be calibrated prior to use and calibration will be verified using known calibration weights (e.g., 500 grams).

GPS = global positioning system

HASP = Health and Safety Plan

NA = not applicable

PID = photoionization detector

SOP = Standard Operating Procedure

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Deleted: dissolved oxygen – stable reading of standard solution (100% saturation with deionized water) after 30 seconds with no error message displayed;

Deleted: conductivity – $\pm 1\%$;

Deleted: salinity – zero (using deionized water);

Deleted: velocity – ± 0.1 meters per second; water depth – ± 0.1 feet.

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QAPP Worksheet #27 Sample Custody Requirements

Sample Custody Procedures

Sample custody, or chain of custody, protocols are in three parts: 1) sample collection, 2) laboratory analysis, and 3) final documentary files.

A sample or documentary file is considered under custody if one or more of the following criteria are met:

- ☐ Sample or file is in possession of an authorized project team member.
- ☐ Sample or file is placed in a designated secure area to prevent tampering.

1.) Sample Collection Custody Procedures

Field Chain of Custody Procedures

The sample packaging and shipment procedures summarized below are designed to confirm that the samples will arrive at the laboratory with the chain of custody intact. The protocols for specific sample numbering and other sample designations are also included.

Field Procedures

The field sampler will be personally responsible for the care and custody of the samples until the samples are transferred. As few people as possible will handle the samples.

Sample containers will be tagged or labeled with unique sample identification numbers (as described below), as well as time and date of sample collection. Sample tags or labels will be completed for each sample using pre-printed labels or using permanent, waterproof ink either prior to or immediately after sample collection. An example sample label is provided in Standard Operating Procedure- (SOP-) 8 (Appendix A).

Sample Identification Codes

Sample identification codes are pre-assigned and are found in Worksheets #18-1 and #18-2.

Combined Sewer Overflow (CSO), Stormwater Outfall, and Publically Owned Treatment Works (POTW) Sample

The standard sample identification number will consist of a unique 14- or 15-character string used to identify each sample collected and submitted to the laboratories for analysis, as follows:

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|-------------------------|---|
| Characters 1 and 2: | Two characters to describe the regional location where the sample was collected. This will be "PR" for lower Passaic River. |
| Character 3: | One digit to describe the phase during which the sample was collected (i.e., "1" for Phase I and "2" for Phase II). |
| Characters 4, 5, and 6: | Three characters to describe the sample type. This will be "CSO", "SWO", and "POT" (for POTW). |
| Characters 7, 8, and 9: | Three characters to describe the sampling location. For example, "VER" for Verona Avenue. |
| Characters 10 and 11: | Two characters to describe the sample matrix. This will be "WW" for whole water, "GD" for grab dissolved (field-filtered for metals) whole water, "GW" for grab whole water, "LD" for low-solids mass (LSM) dissolved, "LP" for LSM particulates, "HD" for high-solids mass (HSM) dissolved, and "HP" for HSM particulates. Note that the LSM bulk material will be assigned an interim identification code "LB" for transporting the LSM bulk sample to the laboratory. Once at the laboratory, the LSM bulk material will be filtered in accordance with SOP No. L-24 – LSM Bulk Sample Filtration, to generate LSM particulate "LP" and LSM dissolved "LD" samples for analysis. |

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QAPP Worksheet #27 Sample Custody Requirements (Continued)

Characters 12 and 13: A two-digit number (preceded by a hyphen) to describe the sequence of the sampling event (either the first 01 or second 02) at the specified location.

Characters 14: One character to describe the sampling attempt. This will be "A" for the first attempt, "B" for the second attempt and "C" for a third attempt.

Character 15: One character to describe the HSM particulate fraction as two HSM particulate fractions may be encountered (e.g., fine material and non-fine material). "1" will be used for the fine fraction and "2" will be used for the non-fine (e.g., paper-like) fraction. The fine and non-fine material will only be analyzed separately for volatile organics (the material will be homogenized in the field for other analyses per SOP 4). A physical description of the fractions will be recorded in accordance with SOP 7.

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The complete list of sample identification codes are provided in Worksheets #18-1 and 18-2. The following table lists examples of sample identification numbers for CSO samples collected from Verona Avenue for the Phase I program:

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Sample Identification Code	Explanation
PR1CSOVERWW-01A	First whole water sample from Verona Avenue CSO, first sample collection attempt
PR1CSOVERGW-01A	First grab metals whole water sample from Verona Avenue CSO, first sample collection attempt
PR1CSOVERGD-01A	First grab metals dissolved sample from Verona Avenue CSO, first sample collection attempt
PR1CSOVERLD-01A	First LSM dissolved sample from Verona Avenue CSO, first sample collection attempt
PR1CSOVERLP-01A	First LSM particulate sample from Verona Avenue CSO, first sample collection attempt
PR1CSOVERHD-01A	First HSM dissolved sample from Verona Avenue CSO, first sample collection attempt
PR1CSOVERHP-01A	First HSM particulate sample from Verona Avenue CSO, first sample collection attempt
PR1CSOVERHP-01A1	First HSM particulate sample from Verona Avenue CSO, first sample collection attempt collected for the fine fraction of the HSM particulate solids

Equipment, Rinsate, and Field Blank Identification

Equipment, rinsate, and field blank samples will be labeled by a unique nine-character string, as follows:

Characters 1 and 2: Two characters to describe the location where the sample was collected. This will be "PR" for lower Passaic River.

Character 3: One-digit to describe the phase during which the sample was collected (i.e., "1" for Phase I and "2" for Phase II).

Characters 4 and 5: A two-digit number to describe the order in which blank samples are collected within the project, sequentially numbered from the beginning of the project (01-99).

Characters 6 and 7: Two characters to describe the equipment with which the blank is associated. This will be "WW" for whole water (the whole water tank), "GM" for grab metals (the metals sampling tubing and filter), "LB" for LSM bulk (the LSM bulk tank, which is the same as the whole water bulk tank), "CF" for continuous flow centrifuge (CFC), "LD" for LSM dissolved, and "LP" for LSM particulate (the "LB" blank will become an "LD" or "LP" blank after separation by the laboratory, the "LB" designation is meant as an interim name for transport of the material to the laboratory).

Characters 8 and 9: Two characters to signify the type of blank (i.e., "EB" for equipment blank, "RB" for rinsate blank, and "FB" for field blank). The blanks collected from the whole water/LSM bulk sample collection tank, CFC and metals sampling equipment and tubing will be field blanks, the blanks from the stainless steel spoons/bowls will be rinsate blanks, and the blanks from the LSM separation laboratory equipment will be equipment blanks.

QAPP Worksheet #27
Sample Custody Requirements (Continued)

The following is an example of a blank sample:

PR203CFFB

Explanation:

The sample was the third field blank collected through the CFC during Phase II of the CSO investigation.

Trip Blank Identification

Trip blank samples will be labeled by a unique 13-character string, as follows:

Characters 1 and 2: Two characters to signify a trip blank. These will be "TB".

Character 3: One character to signify the type of trip blank. This will be either a "V" for volatile organic compounds or an "M" for metals trip blank.

Characters 4 through 11: Eight digits to describe the date using a two-digit month, two-digit day, and four-digit year (e.g., MMDDYYYY).

Characters 12 and 13: A two-digit number (preceded by a hyphen) to describe the order in which trip blanks were collected that day. Each cooler with sediment or aqueous samples for volatile organic compound (VOC) analysis will contain a trip blank for VOC analysis. Each cooler with aqueous samples for metals analysis will contain a trip blank for metals analysis. The first trip blank will be "01" and will increase sequentially through the day.

The following is an example of a trip blank:

TBV03152011-02

Explanation:

The sample was the second trip blank for volatile organic compounds and was collected on March 15, 2011.

Duplicate Identification

Duplicate samples will be labeled by a unique 11 or 12-character string, as follows:

Characters 1 and 2: Two characters to describe the location where the sample was collected. This will be "PR" for lower Passaic River.

Character 3: One-digit to describe the phase during which the sample was collected (i.e., "1" for Phase I and "2" for Phase II).

Characters 4 and 5: Two characters to describe the sample matrix, in this case "WW" for whole water.

Characters 6, 7, and 8: Three characters to signify a duplicate. These will be "DUP".

Characters 9 and 10: A two-digit number (preceded by a hyphen) to describe the position of the duplicate in the sequence collected, sequentially numbered from 01 to 99.

Character 11: One character to describe the sampling attempt. This will be "A" for the first attempt, "B" for the second attempt and "C" for a third attempt.

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QAPP Worksheet #27 Sample Custody Requirements (Continued)

Character 12: One character to describe the HSM particulate fraction as two HSM particulate fractions may be encountered (e.g., fine material and non-fine material). "1" will be used for the fine fraction and "2" will be used for the non-fine (e.g., paper-like) fraction. The fine and non-fine material will only be analyzed separately for volatile organics (the material will be homogenized in the field for other analyses per SOP 4).

The following is an example of a duplicate sample:

PR2WWDUP-02A

Explanation:

The sample was the first sampling attempt for the second duplicate collected for whole water from the Passaic River Phase II project. Duplicate sample locations will be specifically identified in a logbook and transferred to the database.

The following is an example of a duplicate sample for HSM particulate sample in the event that two HSM particulate fractions are encountered:

PR1HPDUP-02A1

Explanation:

The sample was the first sampling attempt for the second duplicate collected for fine fraction of the HSM particulate solids from the Passaic River Phase I project. Duplicate sample locations will be specifically identified in a logbook and transferred to the database.

Sample Delivery Group (SDG) Number Identification

The standard SDG number will consist of a unique five-character string used to identify each SDG submitted to the laboratories for analysis, as follows:

Characters 1 and 2: Three characters to describe the location where the sample was collected. This will be "PR" for lower Passaic River.

Character 3: One-digit to describe the phase during which the samples were collected (i.e., "1" for Phase I and "2" for Phase II).

Characters 4 and 5: A two-digit number to describe the SDG, sequentially numbered beginning with 01 up to 99.

The following is an example of an SDG number:

PR201

Explanation:

The SDG was the first SDG from Phase II submitted to the laboratory for analysis.

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QAPP Worksheet #27 Sample Custody Requirements (Continued)

Total Suspended Solids (TSS) and Total Dissolved Solids (TDS) Identification Codes

Grab samples taken approximately every half hour for TSS/TDS monitoring will be identified by an 18-character string, as follows:

- Characters 1 and 2: Two characters to describe the regional location where the sample was collected. This will be "PR" for lower Passaic River.
- Character 3: One digit to describe the phase during which the sample was collected (i.e., "1" for Phase I and "2" for Phase II).
- Characters 4, 5, and 6: Three characters to describe the sample type. This will be "CSO", "SWO", and "POT" (for publicly owned treatment works).
- Characters 7, 8, and 9: Three characters to describe the sampling location. For example, "VER" for Verona Avenue.
- Characters 10 and 11: Two characters to describe the sample matrix. This will be "GW" for grab whole water.
- Characters 12 through 15: Four characters to describe the time the sample was taken using a 24 hour format. For example, "0915" would denote the sample was taken at 9:15 am.
- Characters 16 and 17: A two-digit number (preceded by a hyphen) to describe the sequence of the sampling event (either the first, 01, or second, 02) at the specified location.
- Character 18: One character to describe the sampling attempt. This will be "A" for the first attempt, "B" for the second attempt and "C" for a third attempt.

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The following is an example of a grab whole water TSS/TDS monitoring sample:

PR1CSOVERGW0915-01A

Explanation:

- ☐ The sample was collected in the Passaic River as part of the CSO investigation.
- ☐ The sample was the first phase of the CSO investigation.
- ☐ The sample was collected from a CSO.
- ☐ The sample was collected at the Verona Avenue location.
- ☐ The sample matrix was grab whole water.
- ☐ The sample was collected at 9:15am
- ☐ The sample was the first sample collected for this location.
- ☐ This was the first collection attempt for this sample

Field Logbooks/Documentation

Pertinent field information will be recorded in a logbook and/or an appropriate form (as described herein) with an indelible marking pen. Field form entries may be recorded on hard copy forms or electronically in a field database. A key that describes each entry is provided for each form. Logbook entries will be factual and observational (i.e., no speculation or opinion), and will not contain any personal information or non-project-related entries. Separate and dedicated logbooks may be kept for different operations running concurrently (e.g., continuous flow centrifuge, metals sampling); individual tasks making up each operation will be maintained in the same logbook, if possible. The cover and binding of each logbook will be labeled to identify the operation and dates included within the logbook; each page in the logbook will be consecutively numbered.

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QAPP Worksheet #27 Sample Custody Requirements (Continued)

Transfer of Custody and Shipment Procedures

The following procedures will be incorporated for the transfer of sample custody and sample shipment.

Samples are accompanied by a properly completed Chain of Custody Form. An example Chain of Custody Form is located in SOP-8 (Appendix A). The sample identification numbers and locations will be listed on the chain of custody record. The custody record will be signed by the sampler. The Chain of Custody Form will document the transfer of guardianship of samples from the sampler to another person, to the permanent laboratory, and to/from a secure storage area. Upon transferring the possession of samples, the individuals relinquishing and receiving the samples will sign, date, and note the time on the Chain of Custody Form.

Samples will be properly packaged for shipment and dispatched to the appropriate laboratory for analysis with a separate signed custody record enclosed in each sample cooler. The original record will accompany the shipment and a copy will be retained by the sampler to include in the project files.

Shipping coolers will be secured with strapping tape and tamper-proof custody seals for shipment to the laboratory. An example custody seal is located in SOP-8 (Appendix A).

If the samples are sent by common carrier, a bill of lading will be used. Bills of lading will be retained as part of the permanent documentation. Commercial carriers are not required to sign off on the Chain of Custody Form, as long as the forms are sealed inside the sample cooler and the custody seals remain intact.

2.) Laboratory Analysis Custody Procedures

Laboratory analysis custody procedures for sample receiving and log in, sample storage, and tracking during sample preparation and analysis is described below.

Samples submitted to the laboratory will be accompanied by a Chain of Custody Form. The Chain of Custody Forms will be completed and sealed within the sample transport container, which will be opened and examined by the Laboratory Sample Custodian. The Laboratory Sample Custodian will confirm that entries on the Chain of Custody Form correspond with the sample container labels. If discrepancies are noted by the Laboratory Sample Custodian, project staff will be contacted to resolve any conflicting information.

Evidentiary documentation procedures will be implemented by the laboratory. The designated Laboratory Sample Custodian will receive and document samples submitted to the laboratory. The Laboratory Sample Custodian will examine the condition, preservation, and accompanying documentation of submitted samples prior to approval and formal acceptance by the laboratory. Any sample, preservation, or documentation discrepancies (i.e., broken sample container, improper preservation, inadequate sample volume, unacceptable cooler temperature, or poor documentation) will be resolved before the sample is approved and formally accepted for analysis. Required acceptance data will be recorded and documented in the laboratory sample log and Laboratory Information Management System. The sample will be labeled with a unique laboratory identification and placed in the secure sample storage area prior to distribution to the appropriate analyst(s).

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QAPP Worksheet #28-1b
HSM Particulate Field Quality Control Samples

Matrix	HSM Particulate
Analytical Group	Semivolatile Organics, Volatile Organics, Aroclor PCBs, Organochlorine Pesticides, Semivolatile Organics (SIM), Cyanide, PCDD/PCDFs, PCB Congeners, Chlorinated Herbicides, TOC, TEPH
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-1, L-2, L-7, L-8, L-9, L-10, L-11, L-13, L-26
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT, Vista Analytical
Number of Samples Collected	See Worksheet #20-1b

QC Sample	Frequency Number	Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Rinsate Blank ^b	1 per decontamination event (not to exceed 1 per day)	Associated data will be critically assessed to determine the impact to data quality	Accuracy/Bias Contamination	No target compounds >PQL
Field Duplicates ^d	1 field duplicate will be collected at a frequent of 1 per sample delivery group not to exceed 1 per 20 field samples per matrix and per method	Associated data will be critically assessed to determine the impact to data quality	Precision	RPD ≤50% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples
Trip Blank	1 trip blank will be included with each shipment of samples which contains volatile organics field samples	Associated data will be critically assessed to determine the impact to data quality	Accuracy/Bias Contamination	No target compounds >PQL
Field Blank ^{a, b}	1 per sampling event	Associated data will be critically assessed to determine the impact to data quality	Accuracy/Bias Contamination	No target compounds >PQL

See footnotes after Worksheet 28-1g for description.

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QAPP Worksheet #28-1g
Grab Sample Whole Water Field Quality Control Samples

Matrix	Grab Sample Whole Water
Analytical Group	TSS/TDS
Concentration Level	Low
Sampling SOP	SOP-3
Analytical Method/SOP Reference	L-15, L-16
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
Number of Samples Collected	See Worksheet #20-1g

QC Sample	Frequency Number	Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Duplicates	1 field duplicate will be collected at a frequent of 1 per sample delivery group not to exceed 1 per 20 field samples per matrix and per method	Associated data will be critically assessed to determine the impact to data quality	Precision	RPD $\leq 20\%$ when target is detected in both field duplicate samples at $>5X$ PQL, or concentrations differ by less than $2X$ the PQL when detects are $<5X$ PQL for both field duplicate samples
Field Blank ^a	1 per sampling event	Associated data will be critically assessed to determine the impact to data quality	Accuracy/Bias Contamination	No target compounds $>PQL$

Notes:

^a Field blanks will be collected in association with various matrix types. Whole water, HSM dissolved, LSM particulate, and LSM dissolved will share bulk sample container liner field blank. HSM particulate and HSM dissolved will share a field blank from the continuous flow centrifuge. A field blank will also be associated with the grab sample whole water and grab sample dissolved.

^b The rinse blank will be applied to HSM particulate.

^c The LSM bulk sample separation equipment blank will be applied to both LSM particulate and dissolved-phases.

Upon completion of Phase I, USEPA will evaluate the precision associated with field duplicate samples collected during Phase I to determine if, during implementation of Phase II, laboratory corrective actions are warranted based upon the field duplicate precision achieved during Phase I.

^d In the event that two different type/size of solids (fine and non-fine paper-like material) are recovered in the CFC bowl, field duplicates will be collected for both type of HSM Particulate solids and analyzed for volatile organics.

DOC = dissolved organic carbon

HSM = high-solid mass

LSM = low-solid mass

PCBs = polychlorinated biphenyls

PCDD/PCDFs = polychlorinated dibenzo-*p*-dioxins and dibenzofurans

POC = particulate organic carbon

PQL = project quantitation limit

QC = quality control

RPD = relative percent difference

SIM = selective ion monitoring

SOP = Standard Operating Procedure

TDS = total dissolved solids

TEPH = total extractable petroleum hydrocarbon

TOC = total organic carbon

TSS = total suspended solids

USEPA = U.S. Environmental Protection Agency

**Standard Operating Procedure
No. 2**

Pre-Mobilization

August 2013

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1 Schematic of Weighted Rod/Tubing Assembly	
2 Schematic of Sample Collection Equipment Setup	

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1. Purpose and Scope

The purpose of this document is to define the standard operating procedure (SOP) for pre-mobilization setup of sample collection equipment and supplies. Pre-mobilization activities consist of securing the continuous flow centrifuge (CFC), bulk sample collection tanks, peristaltic pumps and tubing, and related equipment and supplies on a trailer-mounted system. The sampling equipment will be pre-assembled and mounted in an enclosed trailer for instant departure to the sampling location given a short-term notice of a storm event.

This SOP describes the equipment, field procedures, materials, and documentation procedures necessary to pre-assemble the sample collection equipment prior to mobilization.

This SOP may change depending upon field conditions, equipment limitations, or limitations imposed by the procedure. Substantive modification to this SOP will be approved in advance by Tierra Solutions, Inc.'s (Tierra's) Project Coordinator and the U.S. Environmental Protection Agency Remedial Project Manager and On-Scene Coordinator.

Other SOPs will be utilized with this procedure, including:

- ☐ SOP No. 1 – Field Reconnaissance
- ☐ SOP No. 3 – Mobilization, Bulk Sample Collection, and Transportation
- ☐ SOP No. 6 – Decontamination
- ☐ SOP No. 7 – Field Documentation.

2. Procedures

Whole water/low-solids mass (LSM) and high-solids mass (HSM) sampling activities are anticipated to be conducted using peristaltic pumps or equivalent, collection tanks, and a CFC staged in an enclosed trailer. In accordance with procedures outlined below, the equipment process tubing and trailer will be set up in advance of a storm event in order to provide a timely departure and quick response to a potential storm event for collecting samples during overflow events. To better predict storm events producing sufficient runoff and, in turn, overflow in the combined sewer overflow/stormwater outfall (CSO/SWO) system for collecting bulk samples, weather and precipitation monitoring and/or forecasting will also be conducted. For a precipitation event to trigger mobilization for sample collection, the event must be

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anticipated to produce at least 0.2 inches of rain with an average intensity of at least 0.03 inches per hour with no more than 4 consecutive dry hours during the event. Prior to Phase I implementation, the Passaic Valley Sewerage Commissioners (PVSC) will be contacted and notified of the sampling program. During an anticipated storm event, the PVSC plant operator will be contacted regarding the timing of possible closing and opening of the regulator/overflow chamber at the proposed sampling locations.

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In instances where this SOP will be utilized, a hard copy or electronic version will be available at the point of use.

2.1 Equipment List

The following equipment list contains equipment and supplies that may be needed in carrying out the procedures contained in this SOP. Not all equipment/supplies listed below may be necessary for a specific activity, and certain of the listed equipment/supplies may only be relevant to equipment deployment activities. Additional equipment/supplies may be required, pending field conditions.

- ☐ personal protective equipment (PPE) and other safety equipment, as required in the Health and Safety Plan (HASP) (Tierra 2010)
- ☐ CSO/SWO Investigation Quality Assurance Project Plan (CSO/SWO Investigation QAPP)
- ☐ enclosed trailer housing pre-mounted sampling equipment (e.g., bulk sample collection tanks, CFC, peristaltic pumps)
- ☐ four trailer jacks to stabilize and distribute the weight of trailer
- ☐ securing straps, chains, rigging, or similar equipment
- ☐ diesel-powered generator (minimum 20-kilowatt), or similar
- ☐ one large-diameter peristaltic pump and three small-diameter peristaltic pump(s), or equivalent
- ☐ approximately 450-liter (approximately 120-gallon) bulk sample collection tank (whole water/LSM bulk sample), or similar
- ☐ approximately 230-liter (approximately 60-gallon) bulk sample collection tank (HSM dissolved sample), or similar

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- ☐ two secondary tanks with open lids (approximately 415-liter [110-gallon] and 585-liter [155-gallon]) to be placed around each bulk sample collection tank
- ☐ Teflon® tank liners to fit approximately 450-liter tank (to be used for both sized bulk sample collection tanks)
- ☐ approximately 150-liter (approximately 40-gallon) effluent tank
- ☐ CFC (Sharples AS-26, or equivalent, with a maximum centrifuge bowl speed of 17,000 revolutions per minute, a force of 20,000 g, and a flow rate of up to 10 to 20 gallons per minute)
- ☐ CFC bowl Teflon® liner
- ☐ CFC precision level
- ☐ stainless steel and/or Teflon® fittings
- ☐ compressor for the mixer (electric, 2 horsepower and 5.5 cubic feet per minute at 90 pounds per square inch)
- ☐ stainless steel mixer
- ☐ stainless steel blender
- ☐ CFC tools, including rubber mallet, wrench, and ratchet
- ☐ Teflon®-lined and Bioprene tubing of multiple-diameters for large-diameter and small-diameter pumps
- ☐ in-line flow meter
- ☐ weighted rod/tubing assembly
- ☐ tripod and winch system or similar
- ☐ multi-parameter water quality meters (Horiba or equivalent)
- ☐ effluent discharge hose
- ☐ lubricant and drain port for large-diameter peristaltic pump

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☐ utility scissor or shears

☐ Kimwipes™

☐ aluminum foil

☐ plastic sheeting

☐ 5-gallon buckets

☐ ground fault circuit interrupter(s)

☐ multiple length power cords

☐ reflective safety cones

☐ manhole access guard railing, or similar

☐ manhole cover lift, pry bar, pick axe, or equivalent

☐ saw-horse or similar

☐ five gas analyzer, Multirae plus, or equivalent

☐ tape measure

☐ tape (i.e., duct, electrical, packaging, and/or similar)

☐ cordless drill, or similar

☐ fastening hardware and zip ties, or equivalent

☐ laboratory-supplied cooler filled with decontaminated trace metals sampling equipment and containers

☐ sample storage coolers

☐ large cooler for transporting the CFC bowl following bulk sample collection

☐ ice

☐ camera

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- ☐ cell phone
- ☐ Daily Activity Log and field form(s)
- ☐ logbook(s)
- ☐ indelible ink pens or grease pencils.

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2.2 Pre-Mobilization Monitoring

Precipitation data and tidal information will be obtained from government sources during the sample collection period. Monitoring of the forecasted weather and tidal information will be reviewed on a daily basis, as necessary, to determine an appropriate time for initiating mobilization for sample collection. For a precipitation event to trigger mobilization for sample collection, the event must be anticipated to produce at least 0.2 inches of rain with an average intensity of at least 0.03 inches per hour with no more than 4 consecutive dry hours during the event. During anticipated storm events, the field sampling crew will coordinate/communicate with PVSC to determine the timing of regulator gate valve closing at the sampling location and appropriate time for initiating and/or mobilizing sampling equipment for sample collection. Sample collection will not be initiated until it is confirmed that the regulator gate valve has been closed and that the tide gate(s) have opened and/or that overflow to the river from the targeted CSO/SWOs is ongoing.

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2.3 Sample Collection Trailer and Equipment Setup Pre-Mobilization Activities

The sample collection trailer will be readied for mobilization to the sampling location at a moment's notice. The sample collection unit will utilize an enclosed trailer as a secure platform for mounting/housing the sampling equipment/controls. Sampling equipment will include a generator, bulk sample collection tanks, peristaltic pumps, CFC, and associated tubing and fittings.

Larger equipment (tanks, pumps, CFC) will be mounted to the trailer and secured to the floor and/or walls of the trailer to prevent movement during transport. The trailer will provide adequate access and ventilation to safely operate sampling equipment.

A weighted rod/tubing assembly will be deployed into the sampling location for bulk sample collection. The weighted rod/tubing assembly consists of a rod (similar to a well screen) to which two intake tubings (trace metals tubing and the large-diameter intake tubing) will be secured and deployed into the sampling location. A conceptual diagram of the weighted rod/tubing assembly is included as Attachment 1 to this SOP.

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Large-diameter tubing will be secured to the weighted rod/tubing assembly and connected to a large-diameter pump in the trailer to pump bulk sample for collection. The large-diameter tubing will be connected from the large-diameter pump to the CFC and will pump bulk sample through the CFC to collect HSM particulate samples. Three sample ports will be installed into the large-diameter tubing line, two before, and one after, the CFC. Small-diameter sample tubing and small-diameter pumps will be connected to the sample ports to pump bulk sample from the large-diameter tubing line. The first sample port will be used to collect total suspended solid (TSS) samples and perform real-time monitoring (using in-line water quality meter). A section of the small-diameter tubing will be installed at the outlet end of the water quality meter and will be connected to the discharge tubing to return effluent back to the sampling location and collect TSS samples every 30 minutes starting 15 minutes after bulk sample collection is initiated. The second sample port on the large-diameter tubing will pump bulk sample into the whole water/LSM bulk sample collection tank to collect LSM bulk and whole water samples. The third sample port will be installed into the bottom of the stainless steel discharge spout coming out of the CFC and will be used to collect HSM dissolved bulk samples in the second HSM dissolved bulk sample collection tank. A flow meter will be installed in-line with the tubing following the CFC and effluent tank.

Deleted: An additional sample port, or similar, will be connected to this line following the water quality meter to collect TSS samples at regular intervals over the sampling period.

The interior of the CFC bowl will be lined with Teflon® liner. Teflon® liners will also be lined along the interior of the whole water/LSM bulk and HSM dissolved bulk sample collection tanks and secured to the tank lid/cover. The open end of the Teflon® liner in each tank will be pulled out (at least 1 foot) through an opening in the tank lid. Small-diameter sample tubing will be inserted into the tank through this liner opening, and the liner and tubing will be secured using multiple zip ties. A stainless steel mixer will be used for continuous sample mixing and homogenization during sub-sampling activities. The bulk sample collection tanks will be graduated to record the volume of the collected bulk sample. The sampling equipment will be pre-assembled and secured on the trailer for mobilization. The small-diameter sample tubing and the Teflon® liners will be dedicated sampling equipment.

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A separate small-diameter tubing will also be secured to the weighted rod/tubing assembly and connected to a small-diameter pump in order to pump samples for metals analysis. This tubing will be secured at the sampling location in accordance with SOP No. 3 – Mobilization, Bulk Sample Collection, and Transportation.

Initially and after each sampling event and associated decontamination activities, the sample collection trailer will be cleaned out of used sampling equipment (e.g., tubing) and re-equipped for mobilization in accordance with this SOP.

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2.3.1 Equipment Setup

The following procedures will be followed to prepare and secure the equipment sampling trailer for departure to each sampling location:

1. Don clean nitrile gloves and appropriate PPE, as required in the HASP (Tierra 2010).
2. After completing decontamination of sampling equipment, as necessary, prepare and install new clean Teflon® liners in the CFC bowl and bulk sample collection tanks. Teflon® liners will be installed along the interior surface of the CFC bowl and the two bulk sample collection tanks.
3. Place the cover/lid on the bulk sample collection tanks. The Teflon® liner will be pushed out (at least 1 foot) through an opening in the tank lid through which the small-diameter sample tubing will be inserted into the sample collection tank. Confirm that the liner is a minimum of 1 foot above the tank cover.
4. Load trailer and secure equipment. Confirm that larger equipment (tanks, pumps, CFC) are mounted to the trailer and secured to the floor and/or walls of the trailer to prevent movement during transport. Secure CFC and CFC bowl for transportation in accordance with manufacturer's instructions. CFC bowl will be secured in a separate box during transport to the sampling location and will be installed in the CFC during setup at the sampling location.
5. Install large-diameter tubing between CFC and large-diameter peristaltic pump in accordance with the diagram (included as an attachment to this SOP).
6. The three sampling ports will be secured inside the trailer. Install two sampling ports into the large-diameter tubing between the large-diameter peristaltic pump and the CFC, as depicted on the diagram. The third sample port is installed into the bottom of the stainless steel discharge spout coming out of the CFC.
7. Using small-diameter tubing, connect the first sample port to a small-diameter peristaltic pump, which will be used to pass bulk sample through an in-line water quality meter for monitoring of field parameters. Install a separate section of small-diameter tubing at the outlet end of the water quality meter for collection of TSS samples at regular intervals over the sampling period and connect it to the return discharge tubing as shown in Attachment 2. TSS samples will be collected directly into laboratory-provided containers.

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8. Using additional small-diameter tubing, connect the second and third sample ports on the large-diameter tubing and CFC discharge spout to small-diameter peristaltic pumps to manage the flow into the two bulk sample collection tanks.
9. Insert the small-diameter tubing into each tank through the liner coming out of the opening in the tank lid/cover. The second sample port and associated peristaltic pump and tubing will be used to collect bulk whole water/LSM sample into the Teflon®-lined approximately 450-liter (approximately 120-gallon) bulk sample collection tank. The third sample port and associated peristaltic pump and tubing will be used to collect bulk HSM dissolved sample into the Teflon®-lined approximately 230-liter (approximately 60-gallon) bulk sample collection tank.
10. A stainless steel mixer will be used for bulk sample mixing and homogenization prior to sub-sampling activities. The stainless steel mixer will be mounted to the center of the sample collection tank lid. Care will be taken during mixing to avoid contact with the tank liner.
11. Connect the outlet of the CFC discharge spout to the effluent holding tank to return effluent to the sampling location post-CFC.
12. Insert flow meter in-line with tubing downstream of CFC and effluent tank. Attach remainder of tubing section to outlet of flow meter to return effluent to sampling location.
13. Load remaining items listed on the equipment list, including the weighted rod/tubing assembly, and any backup supplies, extra sections of tubing, onto the trailer.
14. Close and secure trailer in preparation for immediate departure from the sample processing facility, or alternative designated storage location.

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3. Calibration, Maintenance, and Use of Field Instruments

Prior to use/mobilization, the sampling equipment will be inspected and calibrated in accordance with appropriate sections of the equipment user's manual and the CSO/SWO Investigation QAPP. Field personnel will have the equipment user's manual available for reference and maintenance activities. Equipment inspection and maintenance will be recorded in the logbook.

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4. Quality Assurance

Samplers will confirm the entries in the logs and field books to verify the information is correct. Completed logs and field book entries will be reviewed periodically by Tierra's Project Coordinator and/or Project Quality Assurance Officer, or their designees.

5. Documentation

Detailed pre-mobilization information will be recorded in a logbook (at a minimum) in accordance with SOP No. 7 – Field Documentation.

6. References

Tierra. 2010. Health and Safety Plan. Lower Passaic River Study Area CSO/SWO Investigation. Tierra Solutions, Inc. East Brunswick, New Jersey. Revision 0. July 2010.

**Standard Operating Procedure
No. 3**

**Mobilization, Bulk Sample
Collection, and Transportation**

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1. Purpose and Scope

The purpose of this document is to define the standard operating procedure (SOP) for mobilizing to the sampling location, collecting bulk samples, and transporting bulk samples to the sample processing location. This SOP describes the equipment, field procedures, materials, and documentation procedures necessary to collect bulk sample material. The collection of aqueous grab metals sample using procedures outlined in Method 1669 Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels (U.S. Environmental Protection Agency [USEPA] 1996) is described under SOP No. 5 – Metals Sampling via Method 1669 Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels (USEPA 1996).

This SOP may change, depending upon field conditions, equipment limitations, or limitations imposed by the procedure. Substantive modification to this SOP will be approved in advance by Tierra Solutions, Inc.'s (Tierra's) Project Coordinator and the USEPA Remedial Project Manager and On-Scene Coordinator.

Other SOPs will be utilized in conjunction with this SOP, including:

- ☐ SOP No. 1 – Field Reconnaissance
- ☐ SOP No. 2 – Pre-Mobilization
- ☐ SOP No. 4 – Sample Processing and Collection
- ☐ SOP No. 5 – Metals Sampling via Method 1669 Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels (USEPA 1996)
- ☐ SOP No. 6 – Decontamination
- ☐ SOP No. 7 – Field Documentation
- ☐ SOP No. 9 – Management and Disposal of Residuals
- ☐ SOP No. 10 – Data Management.

2. Procedures

In instances where this SOP will be utilized, a hard copy or electronic version will be available at the point of use.

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2.1 Equipment List

The following equipment list contains equipment and supplies that may be needed in carrying out the procedures outlined in this SOP. Not all equipment/supplies listed below may be necessary for a specific activity. Additional equipment/supplies may be required, pending field conditions.

- ☐ personal protective equipment and other safety equipment, as required in the Health and Safety Plan (HASP) (Tierra 2010)
- ☐ Combined Sewer Overflow/Stormwater Outfall Investigation Quality Assurance Project Plan (CSO/SWO Investigation QAPP)
- ☐ enclosed trailer housing pre-mounted sampling equipment (e.g., bulk sample collection tanks, continuous flow centrifuge [CFC], peristaltic pumps)
- ☐ four trailer jacks
- ☐ securing straps, chains, rigging, or similar equipment
- ☐ diesel-powered generator (minimum 20-kilowatt), or similar
- ☐ one large-diameter high-flow peristaltic pump and three small-diameter low-flow peristaltic pump(s), or equivalent
- ☐ Teflon®-lined tubing (1.125-inch outside diameter [OD] for large-diameter pump and 0.5 inch OD for small-diameter pumps, or as appropriate, to fit peristaltic pumps)
- ☐ Bioprene tubing for large- (1.5-inch inside diameter [ID]) and small-diameter (0.37 inch ID) pump
- ☐ stainless steel and/or Teflon® fittings
- ☐ approximately 450-liter (approximately 120-gallon) graduated bulk sample collection tank (for whole water/low-solids mass [LSM] sample), or similar
- ☐ approximately 230-liter (approximately 60-gallon) graduated bulk sample collection tank (for high-solids mass [HSM] sample), or similar
- ☐ two secondary tanks with open lids (approximately 415-liter [110-gallon] and 585-liter [155-gallon])

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☐ Teflon® tank liners to fit approximately 450-liter tank (to be used for both sized bulk sample collection tanks)

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☐ approximately 150-liter (approximately 40-gallon) effluent tank

☐ CFC (Sharples AS-26, or equivalent) with maximum centrifuge bowl speed of 17,000 revolutions per minute (rpm), a force of 20,000 g, and a flow rate of up to 10 to 20 gallons per minute

☐ CFC bowl Teflon® liner

☐ CFC precision level

☐ in-line flow meter

☐ weighted rod/tubing assembly

☐ water-level meter, or equivalent

☐ multi-parameter water quality meters: Horiba, or equivalent

☐ tripod and winch system or similar

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☐ effluent discharge hose

☐ utility scissor or shears

☐ Kimwipes™

☐ aluminum foil

☐ ice

☐ rubber bands

☐ 5-gallon buckets

☐ ground fault circuit interrupter(s)

☐ multiple length power cords

☐ reflective traffic safety cones/barricades

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- ☐ manhole access guard railing, or similar
- ☐ manhole cover lift, pry bar, pick axe, or equivalent
- ☐ five-gas analyzer, Multi-Rae Plus, or similar
- ☐ tape measure
- ☐ tape (e.g., duct, electrical, packaging, and/or similar)
- ☐ cordless drill, or similar
- ☐ fastening hardware and zip ties, or equivalent
- ☐ ratchet straps
- ☐ laboratory-supplied cooler filled with decontaminated trace metals sampling equipment and containers
- ☐ large cooler for transporting the CFC bowl following bulk sample collection
- ☐ sample storage coolers
- ☐ camera
- ☐ laptop computer
- ☐ cell phone
- ☐ Daily Activity Log
- ☐ Bulk Sample Collection Log
- ☐ logbook(s)
- ☐ indelible ink pens or grease pencils.

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2.2 Mobilization Procedures

2.2.1 Mobilization and Sampling Location Setup

In an effort to quickly respond to storm events causing overflow conditions, the sample collection trailer will be readied for mobilization to the sampling location per SOP No. 2 – Pre-Mobilization. The sampling equipment will be pre-assembled and mounted/secured on the trailer for mobilization, as per SOP No. 2 – Pre-Mobilization. The sample collection trailer will be staged at the sample processing location. Upon establishing that an overflow is expected to occur and/or sampling conditions are favorable, as specified in SOP No. 2 – Pre-Mobilization, the sampling crew will be mobilized to the sample collection trailer location and will mobilize the sample collection trailer to the target sampling location, preferably in advance of a rainfall event. Coordination with appropriate municipality and/or Passaic Valley Sewerage Commissioners (PVSC) and local police must have been completed per SOP No. 2 – Pre-Mobilization to coordinate mobilization and access to the sampling locations. During anticipated storm events, the field crew will coordinate with PVSC regarding the anticipated timing of possible overflow at a specific location from operation of the regulator gate valve. Sample collection will not be initiated until it is confirmed that the regulator gate valve has been closed. In addition, sample collection will not be initiated until it is confirmed that tide gate(s) has opened and/or that overflow to the river from the targeted combined sewer overflow/stormwater outfall (CSO/SWOs) is ongoing.

Upon arrival at the bulk sample collection location, personnel will inspect and identify potential hazards present in the surroundings. Personnel will park the truck and trailer as recommended in the HASP (Tierra 2010) and based on findings/instructions from the reconnaissance activities conducted in accordance with SOP No. 1 – Field Reconnaissance. The sample collection trailer will be staged as close to the sampling location as necessary to minimize impact to the vicinity while providing adequate work area. Traffic safety cones and/or reflective barricades will be used to delineate the work area, associated equipment, and a means for access and egress.

Traffic control and/or site safety may be needed to facilitate collection of bulk samples. A contractor experienced in traffic control and/or local police may be retained to perform traffic/site safety control in accordance with New Jersey Department of Transportation regulations. Where necessary, a Traffic Control Plan outlining notification procedures, crew training, and traffic control measures will be used in this work. Necessary permits will be obtained prior to initiating work.

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2.2.1.1 Sample Equipment Setup

After a safe work environment is confirmed, the on-site sample equipment will be setup as follows:

1. If bulk sampling is to be performed at a manhole or a regulator chamber, use a manhole cover lift, prybar, or equivalent, to safely slide open the cover.
2. Upon removing the manhole cover, place safety guardrail around manhole opening.
3. Conduct air monitoring of sampling location to confirm absence of harmful gases prior to commencing further equipment setup activities. Record air monitoring readings on the Bulk Sample Collection Form in accordance with SOP No. 7 – Field Documentation. Note any unusual odors if present.
4. Visually inspect to confirm overflow conditions. If overflow is occurring or likely to occur, continue with the following procedures. If overflow is not occurring and is likely not to occur, notify the project manager to determine the appropriate course of action.

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5. Connect the water quality meter, Horiba or equivalent, to the total suspended solids (TSS) sample port. The water quality meter will be calibrated daily in accordance with manufacturer's specification prior to mobilization.
6. Setup and level the CFC. The CFC will be leveled in two steps. The first step will involve leveling the trailer using the trailer jacks and levels mounted on the outside of the sampling trailer. Trailer jacks will be adjusted two at a time, along one side of the sampling trailer. The feet of the trailer jacks should be extended as far as possible before the crank is adjusted, in order to avoid overextending the trailer jack. The sampling trailer will first be leveled along one side of the trailer and then along the front to back axis of the sampling trailer. After the sampling trailer has been leveled, the top cover of the CFC will be removed and the CFC bowl will be installed in the CFC. Following the installation of the CFC bowl, a precision level will be set on the main CFC bearing to level the CFC. The trailer jacks will be further adjusted to level the CFC. Note, it is important to level the CFC correctly to allow for correct operation of the CFC.
7. Once the trailer and CFC is leveled, put on hearing protection and turn on the CFC to sample collection speed according to manufacturer's instruction to test the CFC operation. The test will be performed to draw ambient air through the CFC. If the

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CFC operates as per specifications, turn the CFC off in accordance with manufacturer's specifications and continue with the remaining setup.

8. Following setup of the trailer and CFC, secure the trace metals tubing and the large-diameter tubing to the assembled, weighted sampling rod/tubing assembly. Note that only the trace metals tubing will be handled using the methodology described in SOP No. 5 – Metals Sampling via Method 1669 Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels (USEPA 1996). The clean hands person will carefully secure the intake tubing for metals sampling to the weighted rod/tubing assembly to be deployed into the sampling location as per procedures outlined in SOP No. 5 – Metals Sampling via Method 1669 Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels (USEPA 1996). Take precaution to confirm that the ends of hoses/tubing are kept clean and free of contact with other material during final assembly.
9. Upon securing the metals sampling and large-diameter intake Teflon® tubing to the weighted rod/tubing assembly and before deploying, remove the seals from the down hole end of the intake tubings. Deploy the weighted rod/tubing assembly into the sampling location. Confirm that the tubing inlets will be a minimum of 1 foot from the bottom of the sampling location, and that tubings are oriented as needed. Note deployment location and if any adjustments are made after securing the apparatus.
10. Lower the weighted rod/tubing assembly using a tripod and winch system to the pre-established sample collection location and depth/elevation for the target location. Note that the sample collection location and elevation will be determined for each target CSO/SWO during field reconnaissance activities and tabulated for use during sample collection activities. Confirm that the sample collection depth/elevation is set correctly by subtracting depth measurement on the rod/tubing assembly to the pre-established top to rim, or equivalent elevation. Record sample collection location and depth/elevation in the field book. The portion of the rod assembly extending above the sampling location (e.g., manhole) will be supported and secured in place prior to commencing any sample collection. Note deployment location and if any adjustments are made after securing apparatus.
11. Inspect the sample equipment setup and assembly to confirm that the connections and equipment are secured and setup correctly to initiate bulk sample collection.

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<#>Setup and level the CFC. The CFC will be leveled in two steps. The first step will involve leveling the trailer using the trailer jacks and levels mounted on the outside of the sampling trailer. Trailer jacks will be adjusted two at a time, along one side of the sampling trailer. The feet of the trailer jacks should be extended as far as possible before the crank is adjusted, in order to avoid overextending the trailer jack. The sampling trailer will first be leveled along one side of the trailer and then along the front to back axis of the sampling trailer. After the sampling trailer has been leveled, the top cover of the CFC will be removed and the CFC bowl will be installed in the CFC. Following the installation of the CFC bowl, a precision level will be set on the main CFC bearing to level the CFC. The trailer jacks will be further adjusted to level the CFC. Note, it is very important to level the CFC correctly to allow for correct operation of the CFC. ¶¶

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2.3 Sample Collection Procedures

This section provides procedures for collecting bulk samples and TSS grab samples. Metals analysis sample collection will also be discussed in the following sections. Metals sample collection procedures are provided in SOP No. 5 – Metals Sampling via Method 1669 Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels (USEPA 1996).

Sample collection procedures will involve pumping and collecting bulk effluent from target CSO/SWO to process and generate LSM, HSM, and whole water samples. The whole water/LSM bulk sample and the HSM sample (particulate and dissolved) will be collected simultaneously from the same effluent stream. The effluent for collection of HSM samples will be processed via continuous flow centrifugation, with the solids retained in the CFC and elutriate collected in a collection tank. Excess effluent will be returned directly to the CSO without chemical addition or treatment. The collection of effluent used to generate the whole water/LSM bulk sample and HSM samples will occur over the same length of time by controlling the flow rate of effluent entering each bulk sample collection tank and the CFC.

Following collection of effluent into the bulk sample collection tanks and through the CFC, LSM samples will be collected from the whole water/LSM bulk sample collection tank and submitted to the laboratory for collection of LSM particulate and LSM dissolved samples for analysis. Whole water samples will be collected from the whole water/LSM bulk sample collection tank and submitted to the laboratory for analysis. HSM particulate samples will be collected from the solids retained in the CFC, and HSM dissolved samples will be collected from the HSM dissolved bulk sample collection tank for laboratory analysis. The samples will be processed and shipped the day after bulk sample collection. Efforts will be made to process and ship the metals analysis samples the same day of bulk sample collection contingent on the time of sample collection.

2.3.1 Initiating Bulk Sample Collection

After system setup, the system will be activated for bulk sample collection. The following procedures will be followed for bulk sample collection:

1. Put on hearing protection and turn on CFC to sample collection speed according to manufacturer's instruction. The CFC is programmed to automatically spin up to 17,000 rpm after pushing the start button.
2. Start the large-diameter peristaltic pump at a slow speed to draw bulk sample from the sampling location. Adjust speed of the large-diameter peristaltic pump using

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Prior to starting bulk sample collection and after confirming that overflow to the river is taking place, complete a test run to verify flow rates into the bulk sample collection tanks and through the CFC.¶
<#>Supply power to assembled sampling equipment system.¶
<#>Start CFC per manufacturer's instruction and run so that solids will not accumulate in the CFC bowl.¶
<#>Start large-diameter peristaltic pump at a slow speed to draw bulk sample from the sampling location and pump it through the system while keeping the small-diameter peristaltic pumps off, thus preventing any material from entering the two bulk sample collection tanks. ¶
<#>Measure the flow produced by the large-diameter peristaltic pump (target is 10 to 20 gallons per minute [gpm]) using the in-line flow meter installed on the tubing after the CFC and the HSM dissolved sample port. Adjust the flow as needed.¶
<#>Disconnect the small-diameter sample tubing from the tanks, turn on each of the small-diameter peristaltic pumps one at a time, and measure the actual flow of each pump using a graduated cylinder, or similar.¶

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<#>Turn small-diameter peristaltic pumps off. Reconnect the small-diameter sample tubings to the bulk sample collection tanks.¶
<#>Temporarily capture the test run liquid in 5-gallon buckets, or equivalent, and return collected liquid to the sample location or storage container for disposal at the PVSC wastewater treatment plant.¶

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the variable frequency drive (VFD). The target speed is 10 to 20 gallons per minute (gpm).

3. Turn on the two small-diameter peristaltic pumps once CFC reaches sample collection speed. Adjust flow of the small-diameter pump to the whole water/LSM bulk sample collection tank to approximately 0.35 gpm, and the flow of the small-diameter pump to the HSM dissolved bulk sample collection tank to approximately 0.17 gpm using the flow controls on the pumps. These flows are based on a targeted 4-hour sample collection period and required sample volume. Flow may be adjusted based on storm intensity and/or sample volume required.
4. Turn on the small-diameter pump connected to the TSS sample port and test flow through the TSS sample port and confirm the water quality meter functions correctly.
5. Record sample collection start time in the logbook and Bulk Sample Collection Form in accordance with SOP No. 7 – Field Documentation.
6. Verify that bulk sample is passing through the CFC and is collected in the two bulk sample collection tanks and is flowing out of the discharge tubing back to the sampling location.
7. Put ice into the secondary tanks around each bulk sampling collection tank.
8. Continue sampling for duration of overflow event or up to 6 hours.

2.3.1.1 Collecting TSS Samples

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TSS samples will be collected during bulk sample collection. Instantaneous grab samples, approximately 1.5 liters in volume, will be collected after the in-line water quality meter approximately every 30 minutes beginning 15 minutes following the start of bulk sample collection. TSS samples will be collected directly into laboratory-provided containers and will be labeled in accordance to SOP No. 8 – Containers, Preservation, Handling, and Tracking of Samples for Analysis. Once collected, samples will be stored in a cooler in the trailer for transport to the sample processing facility where they will be packaged for shipment to the laboratories.

2.3.1.2 Grab Sample Collection

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Grab samples will be collected for metals analysis using the sampling procedures outlined in SOP No. 5 – Metals Sampling via Method 1669 Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels (USEPA 1996). A TSS sample

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will also be collected concurrently with the grab metals samples. Based on an anticipated 4-hour sampling event, metals sampling will be initiated approximately 1.5 hours after start of bulk sample collection, to represent conditions near the temporal mid-point. If the sampling event duration is modified based on field conditions, such as observed solids content, metals sampling may be adjusted accordingly.

2.3.1.3 Water Quality Monitoring

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During bulk sample collection and between TSS grab sample collection, water quality monitoring will be conducted using a multi-parameter water quality meter, Horiba or equivalent. Measurements will be recorded every 15 minutes starting at initiation of bulk sample collection and will be logged continuously to the water quality meter. Monitoring measurement results will also be periodically recorded in a logbook and/or on the Bulk Sample Collection Form in accordance with SOP No. 7 – Field Documentation. Water quality measurements will include conductivity, turbidity, and temperature.

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2.3.1.4 Monitoring Flow Rate

Flow monitoring will be performed during bulk sample collection. The in-line flow meter, located downstream of the CFC, will be used to monitor and record flow approximately every 30 minutes. Flow into the bulk sample collection tanks will be recorded by monitoring the flow into the graduated tanks at approximately 15-minute intervals, or as necessary, and monitoring the flow controls on the pumps to confirm that flow rates into the bulk sample collection tanks remain adequate. Total volume of sample collected will be recorded in a logbook or similar.

2.3.2 System Shutdown

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Once the target sampling duration is achieved and/or overflow stops at the sampling location, the system will be shut down. Upon completion of bulk sample collection activities, the volume of bulk sample collected will be estimated using the graduated tanks and documented prior to breakdown of the sampling equipment in accordance with SOP No. 7 – Field Documentation. The bulk sample collection will be shutdown using the following procedures:

1. Shut down the large-diameter peristaltic pump followed by small-diameter pumps.
2. Continue CFC operation until flow through the outlet of the CFC stops and then turn CFC off in accordance with manufacturer's specifications. The CFC is set to automatically spin down to 0 rpm after the stop button is pushed.

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3. Turn off the power.
4. Disconnect sample tubing as needed, drain lines, and return fluids remaining in the lines to the sample location.
5. Retrieve the weighted rod/tubing assembly from the sampling location.
6. Cap and plug the lines and secure for transport back to the sample processing facility. Tubing connections between the low-flow (small-diameter) peristaltic pumps and the bulk sample collection tanks will remain in place.
7. Remove and secure CFC bowl in a dedicated large cooler with ice, for transportation to the processing facility.
8. Secure the lids of the bulk sample collection tanks using ratchet straps. Confirm that the bulk sample collection tanks remain secured for transportation to the sample processing facility. The weight of the tanks, when full, is expected to be up to approximately 1,000 pounds.

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2.3.3. Demobilization

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Prior to demobilization from the sampling location, secure all materials and equipment in one of the transport vehicles and/or the trailer. Return the excess or purged bulk sample back to the sampling location. Handle other waste materials in accordance with SOP No. 9 – Management and Disposal of Residuals. Replace the manhole cover and verify that the cover is tightly secured to the manhole prior to departure from the sampling location.

2.4 Transportation Procedures

2.4.1 Transportation to Processing Facility

Designated staff members with proper licenses and training (e.g., commercial motor vehicle) will transport equipment and bulk samples to the processing facility upon completion of sample collection activities.

2.4.2 Storage

Bulk samples collected will be cooled until they are processed for shipment to the laboratories. The bulk sample collection tanks will be cooled by placing additional ice in the secondary tanks placed around each bulk sample collection tank. The CFC bowl will be placed on ice within a cooler. It is anticipated that the bulk samples will be

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processed and shipped the day after bulk sample collection. Efforts will be made to process and ship the metals analysis samples the same day of bulk sample collection contingent on the time of sample collection.

3. Calibration, Maintenance, and Use of Field Instruments

Prior to sample collection, the sampling and monitoring equipment will be inspected and calibrated in accordance with appropriate sections of the equipment user's manual and the CSO/SWO Investigation QAPP. Field personnel will have the equipment user's manual available for reference and maintenance activities. Equipment inspection and maintenance will be recorded in the logbook.

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4. Quality Assurance

Samplers will confirm the entries in the logs and field books to verify that the information is correct. Completed logs and field book entries will be reviewed periodically by Tierra's Project Coordinator and/or Project Quality Assurance Officer, or their designees.

5. Documentation

A Daily Activity Log and Bulk Sample Collection Log, in addition to field notes in a logbook, will be recorded during bulk sample collection activities in accordance with SOP No. 7 – Field Documentation.

6. References

Tierra. 2010. Health and Safety Plan. Lower Passaic River Study Area CSO/SWO Investigation. Tierra Solutions, Inc. East Brunswick, New Jersey. Revision 0. July 2010.

USEPA. 1996. Method 1669, Sampling Ambient Water for Trace Metals at EPA Water Criterion Levels, U.S. Environmental Protection Agency, Office of Water Engineering and Analysis Division (4303), July 1996.

Standard Operating Procedure No. 4

Sample Processing and Collection

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Attachments

- 1 HSM Particulate Chemical Analysis Hierarchical Prioritization
- 2 Whole Water and LSM Bulk Sample Chemical Analysis Hierarchical Prioritization
- 3 HSM Dissolved Sample Chemical Analysis Hierarchical Prioritization

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1. Purpose and Scope

The purpose of this document is to define the standard operating procedure (SOP) for processing and collecting whole water samples, low-solids mass (LSM) bulk samples (for subsequent laboratory filtration to collect LSM particulate and LSM dissolved samples), high-solids mass (HSM) dissolved samples, and HSM particulate samples. This SOP describes the equipment, field procedures, materials, and documentation procedures necessary to process the bulk sample collected (as described in SOP No. 3 – Mobilization, Bulk Sample Collection, and Transportation) for shipment to the analytical laboratories. Sample processing and collection will be performed in a secure sample processing facility. Grab metals sample collection and processing procedures are provided in SOP No. 5 – Metals Sampling via Method 1669 Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels (U.S. Environmental Protection Agency [USEPA] 1996).

This SOP may change, depending upon field conditions, equipment limitations, or limitations imposed by the procedure. Substantive modification to this SOP will be approved in advance by Tierra Solutions, Inc.'s (Tierra's) Project Coordinator and the USEPA Remedial Project Manager and On-Scene Coordinator.

Other SOPs will be utilized in conjunction with this SOP, including:

- ☐ SOP No. 3 – Mobilization, Bulk Sample Collection, and Transportation
- ☐ SOP No. 5 – Metals Sampling via Method 1669 Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels (USEPA 1996)
- ☐ SOP No. 6 – Decontamination
- ☐ SOP No. 7 – Field Documentation
- ☐ SOP No. 8 – Containers, Preservation, Handling, and Tracking of Samples for Analysis
- ☐ SOP No. 9 – Management and Disposal of Residuals
- ☐ SOP No. 10 – Data Management.

2. Procedures

In instances where this SOP will be utilized, a hard copy or electronic version will be available at the point of use.

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2.1 Equipment List

The following equipment list contains equipment and supplies that may be needed in carrying out the procedures outlined in this SOP. Not all equipment/supplies listed below may be necessary for a specific activity. Additional equipment/supplies may be required, pending field conditions.

- ☐ personal protective equipment (PPE) and other safety equipment, as required in the Health and Safety Plan (HASP) (Tierra 2010)
- ☐ Combined Sewer Overflow/Stormwater Outfall Investigation Quality Assurance Project Plan (CSO/SWO Investigation QAPP)
- ☐ camera
- ☐ logbooks
- ☐ indelible ink pens or grease pencils
- ☐ tape measure
- ☐ power source; diesel-powered generator (minimum 20-kilowatt)
- ☐ peristaltic pump and Bioprene, or equivalent, peristaltic pump tubing
- ☐ Teflon[®] sampling tubing
- ☐ stainless steel spoons, pliers, spatulas, and bowls
- ☐ stainless steel mixer
- ☐ stainless steel blender and stainless steel lid with rubber stopper
- ☐ Aluminum foil to place on rubber stopper for stainless steel lid of the blender
- ☐ compressor for the mixer (electric, 2 horsepower and 5.5 cubic feet per minute at 90 pounds per square inch)
- ☐ Encore[™] samplers, and T-handle, or equivalent
- ☐ laboratory-supplied (decontaminated) sample containers

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- ☐ continuous flow centrifuge (CFC) tools, including rubber mallet, wrench, and ratchet
- ☐ elbow-length nitrile-knit gloves, or equivalent

☐ Hach® chlorine test strips

Deleted: field portable glove bag: I2R, Model R-37-37H (non-talc), or equivalent; alternatively, a portable glove box may be constructed with non-metallic (polyvinyl chloride pipe or other suitable material) frame and a frame cover made of inexpensive, disposable, non-metallic material (e.g., thin-walled polyethylene bag)

☐ sodium thiosulfate (anhydrous reagent grade)

☐ calibrated small capacity analytical balance (Ohaus SP 602 or similar), with an accuracy of at least 0.01 grams (10 milligrams) and capacity of 600 grams and a large capacity balance (Ohaus ES100L or similar) with reading capacity of minimum 5,000 grams

☐ calibration/verification weight (500 grams)

☐ aluminum foil to weigh sodium thiosulfate

☐ utility scissor or shears

☐ sample preservatives (as required)

☐ polyethylene bags and Ziploc® bags

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☐ sample identification labels

☐ sample packaging material

☐ coolers

☐ ice or similar chilling source

☐ duct tape

☐ decontamination equipment/supplies.

2.2 Sampling Procedures

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This section gives the step-by-step procedures for collecting samples for laboratory analysis once the bulk sample has been collected using SOP No. 3 – Mobilization, Bulk Sample Collection, and Transportation. The following types of samples will be collected in the following order:

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1. HSM particulate samples from the CFC bowl for laboratory analysis.
2. Whole water and LSM bulk (for subsequent laboratory filtration of LSM particulate and LSM dissolved samples) samples from the whole water/LSM bulk sample collection tank for laboratory analysis starting with trace metals sample for whole water analysis.
3. HSM dissolved samples from the CFC elutriate (HSM dissolved bulk sample collection tank) for laboratory analysis.

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HSM particulate samples will be recovered from the CFC bowl and liner into a decontaminated stainless steel bowl for processing into samples for laboratory analysis. Aqueous (whole water, LSM bulk, and HSM dissolved) samples will be processed and collected using peristaltic pump and Teflon® tubing from the bulk sample collection tanks. Following collection and processing, samples will be shipped or driven to the analytical laboratories for subsequent processing and/or analysis. LSM bulk samples collected will be further processed in the analytical laboratories, via filtration, to generate LSM particulate and LSM dissolved samples for analysis.

If sufficient solids or aqueous bulk material is not available for generating samples for all analyses from a specific sample type (for example HSM particulate), a pre-designated analytical hierarchy (Attachments 1 through 3 to this SOP) will be followed to collect only a subset of the analytical samples based on the material available. In these instances, the analytical hierarchy will be applied to all sample types.

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Observations made during sample collection will be recorded in the logbook, as well as the Daily Log, Bulk Sample Collection Form, and Sample Processing Form (attachments to SOP No. 7 – Field Documentation).

2.2.1 Decontamination of Equipment

For equipment used during sample processing, decontamination will be performed in accordance with procedures outlined in SOP No. 6 – Decontamination. Personnel decontamination procedures are contained in the HASP (Tierra 2010). Equipment decontamination will be performed prior to sample processing.

2.2.2 HSM Particulate Sample Collection

Suspended solids retained in the CFC bowl in accordance with SOP No. 3 – Mobilization, Bulk Sample Collection, and Transportation will be processed as follows to collect HSM particulate samples:

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1. Sampling personnel will don clean sampling gloves and PPE, as required in the HASP (Tierra 2010).
2. Place the calibrated small- and large-capacity analytical balances on flat surface or table. Make sure to place table and analytical balances away from sources of drafts or breeze/wind that can potentially interfere with the balance operation and accuracy.
3. Verify the accuracy of the calibrated balances using known calibration weights (500 grams).
4. Place the decontaminated stainless steel bowl on the calibrated large-capacity balance and record the weight of the bowl. Tare the decontaminated stainless steel bowls, which will be used for the collection of HSM particulate solids. Use the large-capacity balance to tare the bowl.
5. Place the CFC bowl on a flat surface or appropriate area to disassemble the CFC bowl. Loosen the CFC tip from the CFC bowl using the wrench and a rubber hammer/mallet. Disassemble the CFC bowl to recover the solids for HSM particulate samples.
6. Carefully remove the Teflon® liner from the bowl using stainless steel pliers, taking care not to lose any solids collected on the liner. Place the liner on a flat surface. In the event that two different solids size/type (e.g., fine and non-fine paper-like material) are recovered in the CFC bowl, collect both the solids size/type in separate decontaminated stainless steel bowls and weigh each solids material separately. Use a stainless steel spoon or spatula to scrape/remove fine solids from the Teflon® liner and place the fine solids in a tared decontaminated stainless steel bowl. If solid material other than fine solids are recovered in the CFC bowl, use a stainless steel spoon or spatula to collect the non-fine solids material in a separate bowl than the fine solids. If solids are observed to be retained on the interior of the CFC bowl (in addition to the liner), use a stainless steel spoon to scoop the solids from the CFC bowl directly into the tared decontaminated stainless steel bowl.
- Set aside the disassembled parts of the CFC bowl (bowl, tip, flange) for decontamination and reuse.
7. Weigh the collected solids (fine and other particulate sample type separately, if necessary, when two distinct sample types are encountered) in the tared decontaminated stainless steel bowls. Note if more than one particulate sample type is encountered, the amount of sample mass collected for each sample type

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Deleted: Use a stainless steel spoon or spatula to scrape/remove solids from the Teflon® liner and place the solids in a tared decontaminated stainless steel bowl.

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will be recorded. Determine whether sufficient solids mass has been collected to generate samples for analyses, as required in Attachment 1 to this SOP. Record the solids mass (or masses if more than one particulate sample type is encountered) in a logbook and in the Sample Processing Form (attachment to SOP No. 7 – Field Documentation).

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8. Confirm that sufficient HSM (particulate and dissolved), whole water, and LSM bulk sample has been collected to perform all analyses. If sufficient bulk sample is collected to perform all of the analyses, proceed to collect HSM particulate samples into the laboratory-supplied sample containers. Record the volume of liquid in the whole water/LSM and HSM dissolved bulk sample collection tanks in the logbook and in the Bulk Sample Collection Form (attachment to SOP No. 7 – Field Documentation).
9. If insufficient bulk sample is collected to complete all the analyses, proceed to collect samples per the analytical hierarchy listed in Attachments 2 and 3 to this SOP.
10. Samples for analysis of volatile organic compounds (VOCs), including material necessary for the percent moisture testing that is required for the analysis, will be collected prior to homogenizing the collected solids using Encore™ samplers. In the event that two different size/type of solids are recovered in the CFC bowl, VOC samples will be collected for both type of solids prior to homogenizing the collected solids. To collect the fine material, push the Encore™ sampler into the fine solids in the stainless steel bowl, which will simultaneously fill the sampler and push out the sampler pin. Alternatively, if the amount of available fine solids is insufficient to sample in this manner, manually pull out the sampler pin and fill the sampler with solids using a stainless steel spoon or spatula. Non-fine solids VOC samples will be collected by manually pulling out the sampler pin and filling the Encore™ sampler with solids using decontaminated stainless steel spoons, spatulas, and/or tweezers as appropriate. Following collection of samples for VOCs, if two different size/types of solids are recovered, proceed to blend the non-fine material in a decontaminated stainless steel blender. After addition of the material to the blender jar, cover the rubber stopper in the stainless steel lid of the blender using aluminum foil prior to use. Following the blending of the non-fine solids, mix the fine solids with the blended non-fine solids in the blender and homogenize the solids. Use a stainless steel spoon or spatula to transfer the homogenized solids into laboratory-supplied containers. It is anticipated the solids can be blended and homogenized in the blender in a single batch. In the event that more than one batch is required, each batch of homogenized solids will be transferred to a stainless steel bowl, homogenized, and then transferred to laboratory-supplied containers.

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11. If only one size/ type of solids are recovered (fine particulates only), use the stainless steel spoon or spatula to homogenize the remaining solids in the stainless steel bowl and transfer the homogenized solids into laboratory-supplied sample containers.

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12. Weigh the collected solids in each tared laboratory-supplied HSM particulate sample container following sample collection. Determine whether sufficient solids mass has been collected to generate samples for analyses, as required in Attachment 1 to this SOP. Record the solids sample mass in each sample container in a logbook.

13. Once the solids are collected into sample containers, secure container caps tightly.

14. Label all sample containers with appropriate sample identification labels in accordance with Worksheets #18-1 and #18-2 of the CSO/SWO Investigation QAPP, and SOP No. 8 – Containers, Preservation, Handling, and Tracking of Samples for Analysis. Record all relevant information in the logbook and the Sample Processing Form (attachment to SOP No. 7 – Field Documentation)

15. Place the filled sample containers on ice in a cooler or in a refrigerator in anticipation of packaging for shipment to laboratories. Follow the procedures for the preservation of samples and chain of custody, handling, packaging, and shipping procedures for samples in SOP No. 8 – Containers, Preservation, Handling, and Tracking of Samples for Analysis.

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The HSM particulate samples will be either shipped or driven to the analytical laboratories. Contingency samples to be shipped to the laboratories will be packed and shipped separately from primary samples. Samples will be processed and shipped/transported the day after bulk sample collection.

2.2.3 LSM Bulk, Whole Water Sample Collection

The LSM bulk and whole water samples will be collected from the whole water/LSM bulk sample collection tank using a peristaltic pump and the same Teflon® tubing that was used to collect the bulk sample. If tubing is considered compromised, it will be replaced with clean tubing.

Prior to beginning LSM bulk and whole water sub-sampling activities, the sampling crew will start the continuous sample homogenization of the bulk sample in the tank. Sample homogenization will be achieved using a stainless steel mixer. A stainless steel mixer will be mounted to the center of the tank lid and utilized to homogenize the

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bulk sample in the tank prior to and during sub-sampling activities. Care will be taken during mixing to avoid contact with the tank liner.

The following procedures will be used for collecting the LSM bulk and whole water samples for analyses, as outlined in Worksheets #19-1 and #19-4 of the CSO/SWO Investigation QAPP. Samples for trace metals will be collected first from the whole water/LSM bulk sample collection tank in accordance with procedures in SOP No. 5 – Metals Sampling via Method 1669 Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels (USEPA 1996). Efforts will be made to process and ship the metals analysis samples the same day of bulk sample collection contingent on the time of sample collection.

Following mixing of the whole water/LSM bulk sample tank and collection of whole water metals sample from the whole water/LSM bulk sample tank, proceed to test for the presence of residual chlorine in the bulk aqueous sample. If testing indicates presence of residual chlorine, add sodium thiosulfate to preserve sample containers for organochlorine pesticides, semivolatile organics (SVOCs), semivolatile organics (SIM), polychlorinated dibenzo-*p*-dioxin (PCDD)/polychlorinated dibenzofuran (PCDF), polychlorinated biphenyl (PCB) congeners, and chlorinated herbicides as outlined in Worksheet #19-1. Sodium thiosulfate will be added to the sample containers for these analyses for both whole water and LSM bulk samples.

Sampling personnel will don clean sampling gloves and PPE, as required in the HASP (Tierra 2010).

1. Loosen the Teflon[®] liner and remove the cover/lid of the bulk sample collection tank to allow for sub-sampling.
2. Prior to beginning sample collection, connect the stainless steel mixer in the tank liner for mixing. Turn on the mixer to mix and homogenize the bulk sample in the tank and continue to mix the bulk sample during sub-sampling activities. Proceed to collect the LSM bulk and whole water samples starting with collection of whole water samples for trace metals, including mercury and methylmercury.
3. Designate clean hands and dirty hands person roles for the sampling procedure. Clean hands and dirty hands roles will be performed only for collection of samples for trace metals.
4. Clean hands and dirty hands persons put on Tyvek[®] suits, wrist-length latex gloves, and additional PPE, as required in the HASP (Tierra 2010). Clean hands also puts on shoulder-length polyethylene gloves. The sampler designated as "clean hands"

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will first dress the sampler designated as "dirty hands," and then the "dirty hands" sampler will dress the "clean hands" sampler.

5. Dirty hands person retrieves the bag containing the laboratory-supplied decontaminated sample containers and opens the outer bag. Clean hands opens the inner bag, removes the sample containers, and places the containers on a table or flat surface. Dirty hands person turns the pump on and allows the pump to run for approximately 1 minute to purge the tubing. Collect the purged effluent in a separate container for disposal in accordance with SOP No. 9 – Management and Disposal of Residuals.

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6. Clean hands person feeds the tubing into the sample containers for collecting total metals samples.

Once all sample containers for trace metals are full, clean hands person carefully caps the containers. Dirty hands person turns off the pump. Dirty hands person retrieves the laboratory-supplied double-bag to store the sample containers. Dirty hands person opens the outer bag and clean hands person opens the inside bag and places the sample containers inside it. Clean hands person then closes the inner bag. Dirty hands person places the double-bagged containers in a cooler with ice. End clean hands and dirty hands roles once all metals samples have been collected.

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7. Following metals sample collection, test the LSM bulk and whole water sample for presence of residual chlorine. Pump an aliquot of the bulk sample from the tank into an unpreserved sample container to test for residual chlorine.
8. According to the manufacturer's instructions, test the aliquot in the sample container using Hach® test strips for presence of residual chlorine in the bulk sample.
9. If the test indicates presence of residual chlorine, preserve the sample containers, designated as follows, with sodium thiosulfate for organochlorine pesticides, SVOCs, SIM, PCDD/PCDF, PCB congeners, and chlorinated herbicides. Follow Steps 10 through 12 for measuring the amount of sodium thiosulfate to add to each sample container.
10. For sample containers requiring sodium thiosulfate preservative, place aluminum foil on a small-capacity scale capable of weighing to 0.01 grams. Weigh the amount of sodium thiosulfate to be added to each sample container as follows:

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- ☐ For a 1-liter sample container, approximately 0.08 grams (± 0.01) of sodium thiosulfate will be added to the sample container.
- ☐ For a 2.5-liter sample container, approximately 0.2 grams (± 0.01) of sodium thiosulfate will be added to the sample container.

11. Place the laboratory-supplied sample containers for LSM bulk and whole water samples on a table or flat surface and remove container's caps one at a time and prepare for collection of samples.
12. Add the sodium thiosulfate to sample containers requiring preservation for residual chlorine. Document the use of sodium thiosulfate as a preservative for each analysis on the COC and in the field book.
13. Proceed to collect the remaining LSM bulk and whole water samples. Fill the LSM bulk and whole water containers placed on the table or flat surface by allowing the bulk sample to flow along the interior surface of the laboratory-supplied containers to minimize sample turbulence. Prevent contact between the outer tubing and the sample. Do not fill sample containers fully. Leave some headspace in the sample containers. The sample containers will be filled per parameter/analysis type rather than per sample type and will alternate between whole water and LSM bulk (e.g., collect samples for SVOCs for both whole water and LSM bulk before proceeding to collect sample for the next parameter/analysis).
14. Once each sample container is full, cap each container and confirm that the container caps are tightly secured. Tape sample caps with electrical tape.
15. Label sample containers with appropriate sample identification labels in accordance with Worksheets #18-1 and #18-2 of the CSO/SWO Investigation QAPP and SOP No. 8 – Containers, Preservation, Handling, and Tracking of Samples for Analysis. Record relevant information in the logbook and the Sample Processing Form (attachment to SOP No. 7 – Field Documentation).
16. Place the filled sample containers on ice in a cooler or a refrigeration unit in anticipation of packaging for shipment to laboratories.
17. Complete chain of custody, handling, packaging, and shipping of samples in accordance with SOP No. 8 – Containers, Preservation, Handling, and Tracking of Samples for Analysis.

The LSM bulk and whole water samples will be either shipped or driven to the analytical laboratories. The LSM bulk samples will undergo laboratory filtration to generate LSM

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particulate and LSM dissolved samples for subsequent analysis. Contingency samples to be shipped to laboratories will be packed and shipped separately from primary samples. Samples will be processed and shipped/transported the day after bulk sample collection.

2.2.4 HSM Dissolved Sample Collection

The HSM dissolved samples will be processed and collected from the tank containing the CFC elutriate bulk sample collected using SOP No. 3 – Mobilization, Bulk Sample Collection, and Transportation and using the sampling procedures outlined in Section 2.2.3 of this SOP. Note that metals samples will not be collected from the HSM dissolved tank and do not re-test for presence of residual chlorine in the HSM dissolved tank. Use results of residual chlorine testing from the whole water/LSM bulk tank and preserve HSM dissolved samples, as necessary, for the specified analyses.

The HSM dissolved samples will be either shipped or driven to the analytical laboratories. Contingency samples to be shipped to laboratories will be packed and shipped separately from primary samples. Samples will be processed and shipped/transported the day after bulk sample collection. Efforts will be made to process and ship the metals analysis samples the same day of bulk sample collection contingent on the time of sample collection.

3. Quality Assurance

Complete the Daily Log and Sample Processing Form (attachments to SOP No. 7 – Field Documentation) to document that the appropriate process is being followed and that pertinent information is being collected and recorded in accordance with the procedures outlined in this SOP. Samplers will confirm the entries in the forms and logbook to verify that the information is correct. Completed forms will be reviewed periodically by Tierra's Project Coordinator and/or Project Quality Assurance Officer, or their designees.

4. Documentation

Field notes will be kept during sample processing and collection activities in accordance with SOP No. 7 – Field Documentation.

5. References

Tierra. 2010. Health and Safety Plan. Lower Passaic River Study Area CSO/SWO Investigation. Tierra Solutions, Inc. East Brunswick, New Jersey. Revision 0. July 2010.

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USEPA. 1996. Method 1669, Sampling Ambient Water for Trace Metals at EPA Water Criterion Levels, U.S. Environmental Protection Agency, Office of Water Engineering and Analysis Division (4303), July 1996.

HSM Particulate Chemical Analysis Hierarchical Prioritization
(Unit of measurement for all values is grams)

Number	Analytical Group	Sample Mass	Masses Needed For QC Samples ^a				Contingency Sample Mass Needed for Vista Labs	Total Sample Mass for Vista Analyses	Cumulative Mass Needed Including Only Vista Contingencies	Contingency Sample Mass Needed For Test America	Total Sample Mass for TA Analyses	Cumulative Mass Needed Including TA and Vista Contingencies
			MS	MSD	Laboratory Duplicate	Field Duplicate						
1	Moisture Content (for VOCs fines)	5	NA	NA	NA	5	NA	NA	10	10	20	20
2	Moisture Content (for VOCs non-fines)	5	NA	NA	NA	5	NA	NA	20	10	20	40
3	Moisture Content (Vista Labs) ^b	5	NA	NA	NA	5	10	20	40	NA	NA	60
4	Moisture Content (Test America) ^b	5	NA	NA	NA	5	NA	NA	50	10	20	80
5	Volatile Organics (fines)	15	15	15	NA	15	NA	NA	110	60	120	200
6	Volatile Organics (non-fines)	15	15	15	NA	15	NA	NA	170	60	120	320
7	PCDD/PCDFs	25	25	25	NA	25	100	200	370	NA	NA	520
8	PCB Congener	25	25	25	NA	25	100	200	570	NA	NA	720
9	Organochlorine Pesticides	25	25	25	NA	25	100	200	770	NA	NA	920
10	Semivolatile Organics (SIM)	30	30	30	NA	30	NA	NA	890	120	240	1160
11	Semivolatile Organics	30	30	30	NA	30	NA	NA	1010	120	240	1400
12	Chlorinated Herbicides	50	50	50	NA	50	NA	NA	1210	200	400	1800
13	Aroclor PCBs	30	30	30	NA	30	NA	NA	1330	120	240	2040
14	TOC	10	10	NA	10	10	NA	NA	1370	40	80	2120
15	Cyanide	5	5	NA	5	5	NA	NA	1390	20	40	2160
16	TEPH	30	30	30	NA	30	NA	NA	1510	120	240	2400
	Total	290	275	260	15	290	310	620	1510 ^c	890	1780	2400 ^d

Notes:

^a QC sample masses are in addition to minimums listed. Contingency volumes given in this chart include QC contingency samples.

^b This additional material for moisture content will be included the same containers as the material bound for chemical analyses.

^c If total HSM particulate mass is below this value then hierarchal prioritization will be used to determine which sample analyses are processed and shipped to laboratories. Contingencies for samples analyzed by Vista Labs will be given priority over primary samples beneath them in this chart. If total HSM particulate mass is between 1440g and 2260g then contingency samples bound for Test America will be processed according to the hierarchal prioritization presented in this chart.

^d If total HSM particulate mass is above this value then there is no need for hierarchal prioritization as all primary samples and contingencies can be accommodated.

PCDD/PCDFs = polychlorinated dibenzo-*p*-dioxins/polychlorinated dibenzofurans

MS = matrix spike

HSM = high-solids mass

QC = quality control

TEPH = total extractable petroleum hydrocarbon

MSD = matrix spike duplicate

TOC = total organic carbon

NA = not applicable

PCB = polychlorinated biphenyls

SIM = selective ion monitoring

Attachment 2
Whole Water and LSM Bulk Sample^a Chemical Analysis Hierarchical Prioritization
(Unit of Measurement for all Values is Liters)

Number	Analytical Group	Sample Volume	Volumes Needed For QC Samples ^b				Analyses Total without Contingencies	Contingency Volumes Needed ^c	Analyses Total with Contingencies	Cumulative Total without Contingencies	Cumulative Total with Contingencies
			MS	MSD	Laboratory Duplicate	Field Duplicate					
1	Volatile Organics	0.120	0.120	0.120	NA	0.120	0.480	0.480	0.960	0.480	230.96
2	TSS/TDS	3	NA	NA	3	3	9	9	18	9.48	239.96
3	PCDD/PCDFs	20	20	20	NA	20	80	80	160	89.48	319.96
4	PCB Congener	10	10	10	NA	10	40	40	80	129.48	359.96
5	Organochlorine Pesticides	5	5	5	NA	5	20	20	40	149.48	379.96
6	Semivolatile Organics (SIM)	5	5	5	NA	5	20	20	40	169.48	399.96
7	Semivolatile Organics	5	5	5	NA	5	20	20	40	189.48	419.96
8	Chlorinated Herbicides	2	2	2	NA	2	8	8	16	197.48	427.96
9	Aroclor PCBs	2	2	2	NA	2	8	8	16	205.48	435.96
10	TOC/POC/DOC	4.25	4.25	4.25	NA	4.25	17	17	34	222.48	452.96
11	Cyanide	0.25	0.25	0.25	NA	0.25	1	1	2	223.48	453.96
12	TEPH	1	1	1	NA	1	4	4	8	227.48	457.96
13	Grain Size	1	NA	NA	1	1	3	3	6	230.48	460.96
Total		58.62	54.62	54.62	4	58.62	230.48	230.48	460.96^d	230.48^e	460.96^f

Notes:

^a Includes Whole Water (48.6% of total) and LSM Bulk (51.4% of total) samples.

^b QC sample volumes are in addition to minimums listed. Contingency volumes given in this chart include QC contingency samples.

^c Contingency samples for LSM Bulk aliquots of PCDD/PCDFs, PCB Congeners, and organochlorine pesticides will take precedence over all other contingency samples after the volatile organics samples (including all QC and contingency samples) are processed.

^d If total sample volume collected is above this value, then there is no need for hierarchical prioritization, as all samples and contingencies can be accommodated.

^e If total sample volume collected is at or below this value, then follow this hierarchy for only primary samples and QC samples, no contingencies will be collected.

^f If total sample volume is below this value but above the total value of the previous column (230.48), then all primary samples, including their QC samples, will be collected, and then this hierarchy chart consulted to determine the collection of contingency samples.

DOC = dissolved organic carbon

LSM = low-solids mass

MS = matrix spike

MSD = matrix spike duplicate

NA = not applicable

PCB = polychlorinated biphenyl

PCDD/PCDF = polychlorinated dibenzo-*p*-dioxin/polychlorinated dibenzofuran

POC = particulate organic carbon

QC = quality control

SIM = selective ion monitoring

TDS = total dissolved solid

TEPH = total extractable petroleum hydrocarbon

TOC = total organic carbon

TSS = total suspended solids

Attachment 3
HSM Dissolved Sample Chemical Analysis Hierarchical Prioritization
(Unit of Measurement for all Values is Liters)

Number	Analytical Group	Sample Volume	Volumes Needed For QC Samples ^a				Analyses Total without Contingencies	Contingency Volumes Needed	Analyses Total with Contingencies	Cumulative Total without Contingencies	Cumulative Total with Contingencies
			MS	MSD	Laboratory Duplicate	Field Duplicate					
1	Volatile Organics	0.120	0.120	0.120	NA	0.120	0.480	0.480	0.960	0.480	109.46
2	TSS/TDS	1.5	NA	NA	1.5	1.5	4.5	4.5	9	4.98	113.96
3	PCDD/PCDFs	10	10	10	NA	10	40	40	80	44.98	153.96
4	PCB Congener	5	5	5	NA	5	20	20	40	64.98	173.96
5	Organochlorine Pesticides	2.5	2.5	2.5	NA	2.5	10	10	20	74.98	183.96
6	Semivolatile Organics (SIM)	2.5	2.5	2.5	NA	2.5	10	10	20	84.98	193.96
7	Semivolatile Organics	2.5	2.5	2.5	NA	2.5	10	10	20	94.98	203.96
8	Chlorinated Herbicides	1	1	1	NA	1	4	4	8	98.98	207.96
9	Aroclor PCBs	1	1	1	NA	1	4	4	8	102.98	211.96
10	DOC	0.25	0.25	0.25	NA	0.25	1	1	2	103.98	212.96
11	Cyanide	0.25	0.25	0.25	NA	0.25	1	1	2	104.98	213.96
12	TEPH	1	1	1	NA	1	4	4	8	108.98	217.96
	Total	27.62	26.12	26.12	1.5	27.62	108.98	108.98	217.96 ^b	108.98 ^c	217.96 ^d

Notes:

^a QC sample volumes are in addition to minimums listed. Contingency volumes given in this chart include QC contingency samples.

^b If total sample volume collected is above this value, then there is no need for hierarchical prioritization, as all samples and contingencies can be accommodated.

^c If total sample volume collected is at or below this value, then follow this hierarchy for only primary samples and QC samples, no contingencies will be collected.

^d If total sample volume is below this value but above the total value of the previous column (108.98), then all primary samples, including their QC samples, will be collected, and then this hierarchy chart consulted to determine the collection of contingency samples.

DOC = dissolved organic carbon

HSM = high-solids mass

MS = matrix spike

MSD = matrix spike duplicate

NA = not applicable

PCB = polychlorinated biphenyl

PCDD/PCDFs = polychlorinated dibenzo-*p*-dioxin/polychlorinated dibenzofuran

QC = quality control

SIM = selective ion monitoring

TDS = total dissolved solids

TEPH = total extractable petroleum hydrocarbon

TSS = total suspended solids

Standard Operating Procedure No. 5

Metals Sampling via Method 1669 Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels (USEPA 1996)

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1. Purpose and Scope

The purpose of this document is to define the standard operating procedure (SOP) for collecting whole water samples for total and dissolved (field-filtered) metals analyses, including mercury and methylmercury, following procedures outlined in the Method 1669 Sampling Ambient Water for Trace Metals at USEPA Water Quality Criteria Levels (U.S. Environmental Protection Agency [USEPA] 1996) using "clean hands" sampling methodologies. The samples for metals analysis will include grab samples collected during bulk sample collection (per SOP No. 3 – Mobilization, Bulk Sample Collection, and Transportation) and samples collected from the whole water/low-solids mass bulk sample collection tank (per SOP No. 4 – Sample Processing and Collection). This SOP describes the equipment, field procedures, materials, and documentation procedures necessary to collect grab samples for trace metals analysis as part of the Combined Sewer Overflow/Stormwater Outfall Investigation Quality Assurance Project Plan (CSO/SWO Investigation QAPP).

This SOP may change, depending upon field conditions, equipment limitations, or limitations imposed by the procedure. Substantive modification to this SOP will be approved in advance by Tierra Solutions, Inc.'s (Tierra's) Project Coordinator and the USEPA Remedial Project Manager and On-Scene Coordinator.

Other SOPs will be utilized in conjunction with this SOP, including:

- ☐ SOP No. 3 – Mobilization, Bulk Sample Collection, and Transportation
- ☐ SOP No. 4 – Sample Processing and Collection
- ☐ SOP No. 6 – Decontamination
- ☐ SOP No. 7 – Field Documentation
- ☐ SOP No. 8 – Containers, Preservation, Handling, and Tracking of Samples for Analysis
- ☐ SOP No. 9 – Management and Disposal of Residuals
- ☐ SOP No. 10 – Data Management.

2. Procedures

In instances where this SOP will be utilized, a hard copy or electronic version will be available at the point of use.

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2.1 Equipment List

The following equipment list contains equipment and supplies that may be needed in carrying out the procedures outlined in this SOP. Not all equipment/supplies listed below may be necessary for a specific activity. Additional equipment/supplies may be required, pending field conditions.

- ☐ personal protective equipment (PPE) and other safety equipment, as required in the Health and Safety Plan (HASP) (Tierra 2010)
- ☐ CSO/SWO Investigation QAPP
- ☐ Ziploc® bags
- ☐ sample identification labels
- ☐ sealable plastic bags and bubble wrap
- ☐ ice or similar chilling source
- ☐ logbooks
- ☐ indelible black ink pens or grease pencils
- ☐ water-level meter or equivalent
- ☐ peristaltic pump
- ☐ external power source (automobile battery or similar)
- ☐ laboratory-supplied cooler filled with decontaminated trace metals sampling equipment and containers (laboratory-supplied [decontaminated] Teflon® sampling tubing and C-Flex brand), or equivalent peristaltic pump tubing (double-bagged), and laboratory-supplied sample collection containers (double-bagged)
- ☐ weighted rod/tubing assembly
- ☐ laboratory-supplied (decontaminated) filter: 0.45 micrometers, 15-millimeter-diameter or larger, tortuous-path capsule filters, Gelman Supor12175, or equivalent (USEPA Method 1669)

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- ☐ field portable glove bag: I2R, Model R-37-37H (non-talc), or equivalent; alternatively, a portable field glove box may be constructed with non-metallic (polyvinyl chloride pipe or other suitable material) frame and a frame cover made of inexpensive, disposable, non-metallic material (e.g., thin-walled polyethylene bag)
- ☐ wrist-length latex gloves or equivalent (non-talc)
- ☐ shoulder-length polyethylene gloves
- ☐ utility scissor or shears
- ☐ duct tape
- ☐ 5-gallon buckets
- ☐ camera
- ☐ decontamination equipment/supplies.

2.2 Sampling Procedures

This section gives the step-by-step procedures for collecting metals samples using USEPA Method 1669 sampling methodologies. The "clean hands" sampling method provides procedures that minimize potential sample contamination from trace metals during sample collection. These procedures designate personnel as "clean hands" and "dirty hands," with specific sampling tasks assigned to each. All operations involving contact with the sample containers and with the transfer of the bulk sample to the sample containers will be handled by the individual designated as "clean hands." Other activities will be implemented by the individual designated as "dirty hands." Sampling activities will be conducted with care to minimize exposure of the sample to atmospheric, human, and other sources of potential metals contamination.

Whole water (total and dissolved) samples for trace metals, including mercury and methylmercury analysis, and a total suspended solids (TSS) sample will be collected using a peristaltic pump and laboratory-supplied Teflon[®] tubing, and will be pumped directly from the sampling location into laboratory-supplied containers. Dissolved metals samples will be collected first by field-filtering the whole water bulk sample followed by collection of samples for total metals analysis. The metals (total and dissolved) samples, including mercury and methylmercury, will be collected as grab samples. Solids retained on the filter will not be analyzed. The samples for metals analysis (total and dissolved) will be collected during bulk sample collection (SOP No. 3 – Mobilization, Bulk Sample Collection, and Transportation). The collection and

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processing of metals samples using "clean hands" procedures will be initiated approximately 1.5 hours after the start of bulk sample collection.

Observations made during sample collection will be recorded in a logbook, as well as the Daily Log and Bulk Sample Collection Form (attachments to SOP No.7 – Field Documentation).

2.2.1 Decontamination of Equipment

Decontamination will be performed prior to sample collection in accordance with procedures outlined in Section 2.2.1 of SOP No. 6 – Decontamination. Equipment, including Teflon® tubing, in-line filters, and sample containers used for collection of metals samples using "clean hands" sampling methodologies will be decontaminated by the laboratory performing the analysis and shipped to the field location prior to sample collection.

2.2.2 Whole Water (Total) and Dissolved Metals and Total Suspended Solids Sample Collection

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Prior to initiating "clean hands" sampling, the sampling team will acquire and inspect the bags containing the required sampling equipment and sample containers. Upon mobilizing to the sampling location, if a decision to collect samples is made, the intake Teflon® tubing for collecting metals samples will be secured and deployed concurrently with the weighted rod/tubing assembly dedicated for bulk sample collection, and metals sampling will begin as described in SOP No. 3 – Mobilization, Bulk Sample Collection, and Transportation.

The following procedures will be used for collection of samples for metals analysis:

1. Designate clean hands and dirty hands person roles for the sampling procedure. It is recommended that the sampling team (clean hands and dirty hands) wash their hands prior to initiating sampling activities.
2. Clean hands and dirty hands persons put on Tyvek® suits, wrist-length latex or equivalent (non-talc) gloves, and additional PPE as required in the HASP (Tierra 2010). Clean hands also puts on shoulder-length polyethylene gloves. The samples designated as "clean hands" will first dress the sampler designated as "dirty hands," and then the "dirty hands" sampler will dress the "clean hands" sampler.
3. Dirty hands person retrieves the double-bag containing the laboratory-supplied, decontaminated Teflon® tubing, to be used as intake tubing for collecting metals samples and opens the outer bag.

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4. Clean hands person opens the inner bag and removes the laboratory-supplied intake Teflon® tubing for collecting metals samples.
5. Dirty hands person retrieves the sampling rod/tubing assembly. The Teflon® intake tubing for collecting bulk sample will be pre-secured to this assembly. Note that only the trace metals tubing will be handled using the methodology described in this SOP.
6. Clean hands person will carefully secure the intake tubing for metals sampling to the weighted rod/tubing assembly to be deployed into the sampling location. The intake end of the metals tubing will be sealed using specialized contaminant-free gloves supplied by the trace metals laboratory while securing the intake tubing to the weighted rod/tubing assembly to minimize contamination. The other end (outlet) of the metals tubing will be secured in the laboratory-supplied double-bag. The other end of the intake tubing comes connected to the C-flex tubing from the laboratory. The C-flex tubing will be connected to the peristaltic pump prior to metals sample collection.
7. Upon securing the intake Teflon® tubing to the weighted rod/tubing assembly, and before deploying, clean hands person will remove the seal from the downhole end of the intake tubing.
8. Dirty hands person will deploy the weighted rod/tubing assembly into the sampling location at the desired depth/elevation.
9. End clean hands and dirty hands roles until collection of samples for trace metals.
10. Approximately 1.5 hours after start of bulk sample collection as per SOP No. 3 – Mobilization, Bulk Sample Collection, and Transportation, reinitiate clean hands and dirty hands roles for collection of samples for trace metals.
11. Clean hands and dirty hands persons put on Tyvek® suits, wrist-length latex or equivalent (non-talc) gloves, and additional PPE as required in the HASP (Tierra 2010). Clean hands person also puts on shoulder-length polyethylene gloves.
12. Dirty hands person removes the peristaltic pump from its bag, sets up the pump, and attaches the power source.
13. Dirty hands person retrieves the double-bag containing the laboratory-supplied decontaminated C-flex tubing and outlet Teflon® tubing with in-line filter and opens the outer bag.

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14. Clean hands person opens the inner bag and removes the outlet Teflon® tubing with in-line filter and C-flex tubing. The laboratory will provide in-line filters connected to the outlet Teflon® tubing. Clean hands person should verify that the tubing is connected properly into and out of the filter.
15. Dirty hands person opens the pump head, and clean hands person then inserts the C-flex tubing into the peristaltic pump. The outlet end of Teflon® tubing with in-line filter will be used to collect the metals samples.
16. Dirty hands person retrieves the bag containing the laboratory-supplied sample containers for metals and opens the outer bag. Clean hands person opens the inner bag, removes the sample containers, and places the containers in the glove bag. Dirty hands person retrieves the TSS sample container, and clean hands person places the TSS sample container in the glove bag.
17. Dirty hands person turns the pump on and allows the pump to run for approximately 2 minutes to purge the tubing and filter. This purged material will be temporarily collected in 5-gallon buckets, or equivalent, and returned to the sample location.
18. Clean hands person feeds the tubing into the glove bag and removes the caps from the sample containers for dissolved metals. The dissolved metals samples will be collected by passing the bulk sample through the in-line filter directly into the sample containers. If the sample container is not pre-preserved, rinse the sample container and cap a minimum of once before collecting the sample.
19. Clean hands person collects dissolved metals samples by first filling only half of each container, and then return to each container to collect the remaining half of the sample. Fill the sample containers by pouring the liquid on the side of the container to minimize sample turbulence and avoiding contact between the outer tubing and the container.
20. Once all sample containers for dissolved metals are full, clean hands person carefully caps the containers. Dirty hands person turns off the pump.
21. Clean hands person removes the filter from the end of the outlet tubing and places it in a plastic bag. After removing the filter from the outlet tubing, proceed to collect whole water (total) metals samples and TSS sample.
22. Clean hands person will change gloves prior to collecting samples for total metals analysis and TSS.

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23. Dirty hands person turns on the pump. Repeat steps 18 through 20 to collect samples for total metals analysis and TSS.

24. Upon collection of all sample containers for metals (total and dissolved) and TSS analysis, dirty hands person turns off the pump.

25. Clean hands person places the sample identification label on the containers. Dirty hands person retrieves the laboratory-supplied double-bag to store the sample containers. Dirty hands person opens the outer bag and clean hands person opens the inside bag and places the sample containers inside it. Clean hands person then closes the inner bag.

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26. Dirty hands person places the double-bagged sample containers in a cooler with ice.

27. Upon collection of all sample containers for metals (total and dissolved) and TSS analysis, dirty hands person removes the tubing from the pump. The pump and tubings will be placed in bags for subsequent disposal. The intake Teflon® tubing will remain deployed into the sampling location and will be retrieved, including the pole/rod and tubing assembly at the end of bulk sample collection.

28. End clean hands and dirty hands roles once all metals samples have been collected.

29. Follow procedures for chain of custody, handling, packaging, and shipping procedures for samples in SOP No. 8 – Containers, Preservation, Handling, and Tracking of Samples for Analysis. Record all relevant information in the logbook and the Bulk Sample Collection Form (attachment to SOP No. 7 – Field Documentation).

The samples for metals (total and dissolved) will not be preserved in the field. Efforts will be made to process and ship the metals analysis and TSS samples via overnight carrier on the same day of bulk sample collection contingent on the time of sample collection.

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3. Quality Assurance

Complete the Daily Log and Bulk Sample Collection Form (attachments to SOP No. 7 – Field Documentation) to document that the process is being followed and that pertinent information is being collected and recorded in accordance with the procedures outlined in this SOP. The sampling team should follow stringent quality assurance/quality control (QA/QC) procedures. QA/QC samples will be collected

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following procedures outlined in SOP No. 6 – Decontamination. Samplers will confirm the entries in the forms and logbook to verify that the information is correct. Completed forms will be reviewed periodically by Tierra's Project Coordinator and/or Project QA Officer.

4. Documentation

Field notes will be kept during sampling activities in accordance with SOP No. 7 – Field Documentation.

5. References

Tierra. 2010. Health and Safety Plan. Lower Passaic River Study Area CSO/SWO Investigation. Tierra Solutions, Inc. East Brunswick, New Jersey. Revision 0. July 2010.

USEPA. 1996. Method 1669, Sampling Ambient Water for Trace Metals at EPA Water Criterion Levels, U.S. Environmental Protection Agency, Office of Water Engineering and Analysis Division (4303), July 1996.

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**Standard Operating Procedure
No. 6**

Decontamination

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1. Purpose and Scope

The purpose of this document is to define the standard operating procedure (SOP) for decontamination of sampling equipment and instruments. Decontamination is the process of neutralizing, washing, and rinsing exposed surfaces of equipment to minimize the potential for contaminant migration and/or cross-contamination. This procedure does not apply to personnel decontamination.

This SOP may change depending upon field conditions, equipment limitations, or limitations imposed by the procedure. Substantive modification to this SOP will be approved in advance by the Investigative Organization and the U.S. Environmental Protection Agency's (USEPA's) Remedial Project Manager and On-Scene Coordinator.

Other SOPs will be utilized with this procedure, including:

- ☐ SOP No. 2 – Pre-Mobilization
- ☐ SOP No. 3 – Mobilization, Bulk Sample Collection, and Transportation
- ☐ SOP No. 4 – Sample Processing and Collection
- ☐ SOP No. 5 – Metals Sampling via Method 1669 Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels (USEPA 1996)
- ☐ SOP No. 7 – Field Documentation
- ☐ SOP No. 8 – Containers, Preservation, Handling, and Tracking of Samples for Analysis
- ☐ SOP No. 9 – Management and Disposal of Residuals.

2. Procedures

In instances where this SOP will be utilized, a hard copy or electronic version will be available at the point of use.

2.1 Equipment List

The following equipment list contains equipment and supplies that may be needed in carrying out the procedures contained in this SOP. Not all equipment/supplies listed below may be necessary for a specific activity. Additional equipment/supplies may be required, pending field conditions.

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- ☐ personal protective equipment (PPE) and other safety equipment, as required in the Health and Safety Plan (HASP) (Tierra Solutions, Inc. [Tierra] 2010)
- ☐ talc-free gloves
- ☐ bristle brushes
- ☐ wash/rinse tubs
- ☐ low-phosphate detergent
- ☐ 10 percent nitric acid, ultrapure
- ☐ ~~methylen~~ ethylene chloride, methanol, and hexane (pesticide grade or better in separate Teflon[®] bottles), as necessary
- ☐ deionized "analyte-free" water
- ☐ peristaltic pump and C-Flex brand, or equivalent, peristaltic pump
- ☐ Teflon[®] sampling tubing
- ☐ one large-diameter and one small-diameter peristaltic pump, or equivalent
- ☐ approximately 470-liter (approximately 125-gallon) bulk sample collection tank (whole water/low-solids mass [LSM] bulk sample), or similar
- ☐ Teflon[®] tank liners to fit approximately 470-liter tank
- ☐ continuous flow centrifuge (CFC) (Sharples AS-26, or equivalent, with a maximum centrifuge bowl speed of 17,000 revolutions per minute, a force of 20,000 g, and a flow rate of up to 20 gallons per minute)
- ☐ CFC stainless steel bowl and Teflon[®] liner
- ☐ stainless steel and/or Teflon[®] fittings
- ☐ hose clamp
- ☐ stainless steel bowls, spoons, pliers, spatulas
- ☐ stainless steel mixer

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- ☐ ~~stainless steel blender and stainless steel lid~~
- ☐ ~~utility scissor or shears~~
- ☐ aluminum foil
- ☐ tap water (from any treated municipal water supply)
- ☐ shoulder-length polyethylene gloves
- ☐ field portable glove bag: I2R, Model R-37-37H (non-talc), or equivalent; alternatively, a portable field glove box may be constructed with non-metallic (polyvinyl chloride pipe or other suitable material) frame and a frame cover made of inexpensive, disposable, non-metallic material (e.g., thin-walled polyethylene bag)
- ☐ laboratory-supplied certified clean sample container for field and rinsate blanks (including decontaminated trace metals sampling equipment and containers)
- ☐ sample identification labels
- ☐ sample packaging material
- ☐ coolers
- ☐ ~~steam or hot-water pressure washer~~
- ☐ ~~ice or similar chilling source~~
- ☐ duct tape
- ☐ logbook
- ☐ indelible ink pens and/or paint pens.

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2.2 Sampling Equipment Decontamination

A decontamination method will be selected from among three defined levels for all non-dedicated sampling equipment based on the intended use of each equipment piece:

- ☐ For equipment used for collecting trace metal samples, decontamination procedures were developed by USEPA (Method 1669: Sampling Ambient Water

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for Trace Metals at EPA Water Quality Criteria Levels [USEPA 1996]).

Decontamination of sampling equipment for trace metals will be conducted by the laboratory and shipped to the sample processing facility ready for sampling.

- ☐ The equipment that will be used for sampling for non-trace metals analyses will be decontaminated following procedures developed according to the USEPA Comprehensive Environmental Response, Compensation, and Liability Act Quality Assurance Manual (USEPA 1989).
- ☐ Equipment that will not be used to collect samples for chemical analysis will be decontaminated using soap and water.

The procedures for these three levels of decontamination are defined below.

Dedicated sampling equipment (e.g., Teflon[®] sampling tubing and tank liners) will not be reused.

2.2.1 Decontamination for Trace Metals Sampling Equipment

Tubing and filters that are used for the collection of samples for trace metals analyses will be certified clean from the laboratory, double-bagged for field application, and dedicated for each sample. If dedicated tubing or filters become compromised, the tubing or filters should be replaced with equipment that is certified clean from the laboratory.

2.2.2 Decontamination for Non-Trace Metals Sampling Equipment

The following steps will be used to decontaminate field sampling equipment designated for non-trace metals (e.g., CFC bowl, CFC bowl Teflon[®] liner, CFC components, stainless steel fittings, and stainless steel tools used for HSM particulate sample collection) prior to the first sampling attempt at each sample location;

Deleted: and will be performed between each sampling event

1. Personnel will dress in suitable PPE to reduce exposure to chemicals and contaminants, as described in the project HASP (Tierra 2010).
2. If equipment is new, proceed to Step 3, below. Otherwise, remove residual sample media on equipment, collect residual, and handle according to the procedures outlined in SOP No. 9 – Management and Disposal of Residuals. Dedicated sampling equipment (CFC bowl Teflon[®] liner, Teflon[®] tank liners and Teflon[®] tubing) will be replaced with new dedicated sampling equipment between sample locations/event. Note that the CFC bowl Teflon[®] liner will be decontaminated per the following steps 3 through 6.

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3. Equipment will be placed in a wash tub or bucket containing Alconox® (or other low-phosphate detergent) and tap water, and scrubbed with a bristle brush or similar utensil. ~~A steam or hot-water pressure washer using tap water will be used to remove any residual sample media from the CFC bowl. Equipment will be rinsed with tap water in a second wash tub or bucket, followed by a nitric acid rinse, a deionized "analyte-free" water rinse, a methanol rinse followed by a hexane rinse, followed by a methylene chloride rinse and lastly with a deionized water rinse. These rinses will utilize sufficient amounts of solvent/water to flush, rather than just wet, the surface. The volume of deionized water used during the rinse must be at least five times the volume of solvent used. Following decontamination, equipment will be placed in a clean area and allowed to air dry. Following air drying, the equipment will be wrapped in aluminum foil (shiny side out) until used for sample collection.~~

Deleted: The stainless steel blender rubber gasket will then be rinsed with tap water followed by a deionized "analyte-free" water rinse but will not undergo further decontamination provided for in step

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Deleted: Note that the stainless steel blender rubber gasket will not be decontaminated with the chemical solvents. ¶

4. Used decontamination water and solvents will be collected and handled in accordance with the procedures outlined in SOP No. 9 – Management and Disposal of Residuals.

2.2.3 Decontamination of HSM Particulate Sampling Equipment Between Multiple Sampling Attempts at a Sample Location

The following steps will be used to decontaminate field sampling equipment designated for HSM Particulate sample collection (e.g., CFC bowl, CFC bowl Teflon® liner, CFC components, stainless steel blender, bowls, spoons, pliers, spatula) between multiple attempts at a single sample location. Note, stainless steel fittings associated with the sampling system prior to entry into the CFC bowl will not be decontaminated (these fittings are included in the decontamination steps outlined in Section 2.2.2).

1. Personnel will dress in suitable PPE to reduce exposure to chemicals and contaminants, as described in the project HASP (Tierra 2010).
2. If equipment is new, proceed to Step 3, below. Otherwise, remove residual sample media on equipment, collect residual, and handle according to the procedures outlined in SOP No. 9 – Management and Disposal of Residuals.
3. Equipment will be placed in a wash tub or bucket containing Alconox® (or other low-phosphate detergent) and tap water, and scrubbed with a bristle brush or similar utensil. A steam or hot-water pressure washer using tap water will be used to remove any residual sample media from the CFC bowl.
4. Equipment will be rinsed with tap water in a second wash tub or bucket, followed by

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a nitric acid rinse, a deionized "analyte-free" water rinse, a methanol rinse followed by a hexane rinse, followed by a methylene chloride rinse and lastly with a deionized water rinse. These rinses will utilize sufficient amounts of solvent/water to flush, rather than just wet, the surface. The volume of deionized water used during the rinse must be at least five times the volume of solvent used. Note that the stainless steel blender rubber gasket will not be decontaminated with the chemical solvents.

5. Following decontamination, equipment will be placed in a clean area and allowed to air dry. Following air drying, the equipment will be wrapped in aluminum foil (shiny side out) until used for sample collection.
6. Used decontamination water and solvents will be collected and handled in accordance with the procedures outlined in SOP No. 9 – Management and Disposal of Residuals.

It should be noted that tubing and tank liners will not be replaced (unless damaged) between sampling attempts at the same sampling location/event. Residual liquid (if present) will be collected and handled in accordance with the procedures outlined in SOP No. 9 – Management and Disposal of Residuals.

2.2.4 Decontamination with Soap and Water

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The following steps will be used to decontaminate equipment that is not intended to collect samples for chemical analysis:

1. Personnel will dress in suitable PPE to reduce exposure to contaminants, as described in the project HASP (Tierra 2010).
2. Remove residual sample media on equipment, collect, and handle according to procedures outlined in SOP No. 9 – Management and Disposal of Residuals.
3. Equipment will be placed in a wash tub or bucket containing Alconox® (or other low-phosphate detergent) and tap water, and scrubbed with a bristle brush or similar utensil. If residual sample media on equipment is not removed by scrubbing, a steam or hot-water pressure washer using tap water may be used to remove the residual sample media. Equipment will be rinsed with tap water in a second wash tub or bucket, and then rinsed again.
4. Following decontamination, equipment will be placed in a dedicated clean area.
5. Rinse water and detergent water will be replaced frequently. Used decontamination

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water will be collected and handled in accordance with the procedures outlined in SOP No. 9 – Management and Disposal of Residuals.

2.3 Field Instruments and Equipment

Instrumentation should be cleaned according to the manufacturer's instructions. Care will be taken to prevent damage to equipment. When possible, instruments that are difficult to decontaminate, such as cameras and data logging instruments, may be protectively wrapped to reduce or eliminate the need for decontamination.

2.4 Collection of Field, Rinsate, and Equipment Blanks

Field, rinsate, and equipment blanks will be collected for the combined sewer overflow/stormwater outfall investigation.

2.4.1 Field Blanks

The term equipment blank is used for a blank collected by pouring or circulating "analyte-free" water onto or through the sampling equipment. A field blank of the fully assembled sample collection system will be collected prior to each sampling event during Phase I. The following field blanks will be collected during each sampling event:

1. One field blank ("CF" indicates ~~field blank from the CFC~~) by pumping "analyte-free" water through the fully assembled sample collection system, including pumps, tubing, and CFC, and collecting the blank from the sample port located at the outlet end (discharge spout) of the CFC (keeping all other sampling ports closed).
2. Two field blanks ("WW" for the whole water field blanks and "LB" for LSM bulk field blank) by pumping "analyte-free" water through the sample collection system, including pumps, tubing, and Teflon[®]-lined whole water/LSM bulk sample collection tank, and collecting the samples from the whole water/LSM bulk sample collection tank. Note that the LSM bulk sample ("LB") will be separated in the laboratory to generate LSM particulate ("LP") and LSM dissolved ("LD") field blank samples for analysis. The "LB" designation is meant as an interim name for transport of the material to the laboratory.
3. Two field blanks ("GM" for grab total metals and "GD" for grab dissolved metals) by pumping laboratory-supplied "analyte-free" water through the laboratory-supplied sample tubing. Grab samples will be collected for metals blanks analysis using the sampling procedures outlined in SOP No. 5 – Metals Sampling via Method 1669 Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels (USEPA 1996).

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2.4.1.1 Collection of Field Blanks from Sample Collection System

The procedure for generating and collecting field blank samples will incorporate designation of clean hands and dirty hands person and other general procedures outlined in SOP No. 5 – Metals Sampling via Method 1669 Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels (USEPA 1996) to minimize potential for cross-contamination:

1. Designate clean hands and dirty hands persons roles for the sampling procedure.
2. Dirty hands person retrieves and dons PPE and assists clean hands person don PPE, Tyvek® suits, wrist-length latex gloves, shoulder-length polyethylene gloves, and additional PPE as required in the HASP (Tierra 2010).
3. Dirty hands person(s) operate pumps and retrieve/handle unopened/sealed laboratory-supplied containers.
4. Clean hands person(s) connect and disconnect tubing and open containers and fill jars and collection tanks with analyte-free water.

The collection procedure for collecting field blanks (WW and LB) through the sample collection system for all analytes, including trace metals, is as follows:

1. Verify that the sample collection system is assembled in accordance with SOP No. 2 – Pre-Mobilization.
2. Partially fill the Teflon®-lined whole water/LSM bulk sample collection tank with “analyte-free” water.
3. Place the inlet end of the large-diameter tubing of the sample collection system into the whole water/LSM bulk sample collection tank. Disconnect the large-diameter tubing from the inlet point to the CFC.
4. Place the disconnected end of the large-diameter tubing into the whole water/LSM bulk sample collection tank. The “analyte-free” water will be pumped from the Teflon®-lined whole water/LSM bulk sample collection tank through the large-diameter Teflon® tubing, two sample ports and fittings, and large-diameter peristaltic pump back into the Teflon®-lined whole water/LSM bulk sample collection tank.
5. Supply power to the sample collection system and start large-diameter peristaltic pump to draw analyte-free water from the Teflon®-lined whole water/LSM bulk

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sample collection tank through the system. Continue to recirculate for sufficient duration to confirm that all the "analyte-free" water is recirculated at least once through the system.

6. Following recirculation, turn off the power to the system. Drain water from the tubing into the Teflon®-lined whole water/LSM bulk sample collection tank.
7. Collect sub-samples from the Teflon®-lined whole water/LSM bulk sample collection tank using a small peristaltic pump and associated Teflon® tubing. Deploy the inlet end of the small-diameter tubing into the Teflon®-lined whole water/LSM bulk sample collection tank. Start the pump and collect the VVW and LB field blank samples into the laboratory-supplied sample bottles for analysis directly from the outlet end of the small-diameter tubing.
8. Preserve the samples, as necessary, in accordance with SOP No. 8 – Containers, Preservatives, Handling, and Tracking of Samples for Analysis.

The collection procedure for collecting field blanks (CF) through the sample collection system for all analytes is as follows:

1. Verify that the sample collection system is assembled in accordance with SOP No. 2 – Pre-Mobilization.
2. Partially fill the Teflon®-lined whole water/LSM bulk sample collection tank with "analyte-free" water.
3. Place the inlet end of the large-diameter tubing of the sample collection system into the Teflon®-lined whole water/LSM bulk sample collection tank.
4. Place a separate tank (approximately 30 gallons) under the outlet end of the CFC. This temporary tank will be lined with similar Teflon® liner used for the high-solids mass (HSM) dissolved bulk sample collection tank. Water will be pumped from the whole water/LSM bulk sample collection tank through the entire sample collection system and will discharge from the outlet end of the CFC into this temporary Teflon®-lined tank.
5. Supply power to the sample collection system and start the CFC at sample collection speed in accordance with manufacturer specifications.
6. Start large-diameter peristaltic pump to draw analyte-free water from the whole water/LSM bulk sample collection tank and pump it through the system.

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7. Collect water in the temporary Teflon®-lined tank at the outlet end of the CFC. Water will also discharge from the HSM dissolved sample port installed at the outlet of the CFC into the temporary Teflon®-lined tank. Continue to operate until sufficient volume of water is collected in the tank for HSM dissolved blank sample collection.
8. Once a sufficient volume of water is pumped through the system, turn off the power to the system and drain the tubing.
9. Collect sub-samples from the temporary Teflon®-lined tank using a small peristaltic pump and associated Teflon® tubing. Deploy the inlet end of the small-diameter tubing into the temporary Teflon®-lined tank. Start the pump and collect the CF field blank samples into the laboratory-supplied sample bottles for analysis directly from the outlet end of the small-diameter tubing.
10. Preserve the samples, as necessary, in accordance with SOP No. 8 – Containers, Preservatives, Handling, and Tracking of Samples for Analysis.
11. Re-assemble tubing so that the sample collection system and trailer is ready for mobilization.

2.4.1.2 Collection of Field Blanks from Grab Metals Sampling Equipment

In addition to the above blank samples, two field blank samples ("GM" for grab total metals and "GD" for grab dissolved metals) will be collected. The field blank samples for trace metals analysis will be collected using the sampling procedures outlined in SOP No. 5 – Metals Sampling via Method 1669 Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels (USEPA 1996). The collection procedure for collecting field blanks through the grab metals sample equipment is as follows:

1. Assemble laboratory-supplied sample tubing with peristaltic pump.
2. Pump "analyte-free" water through the laboratory-supplied sample tubing directly into the laboratory-supplied sample containers.
3. Preserve the samples, as necessary, in accordance with SOP No. 8 – Containers, Preservatives, Handling, and Tracking of Samples for Analysis.

2.4.2 Rinsate Blanks

The term rinsate blank is used for a blank collected from non-dedicated equipment that will be used to collect samples (e.g., CFC bowl, stainless steel spoons, bowls). Rinsate

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blanks will be collected after decontamination between each sampling attempt (if applicable) at a sample location and between each sample location/event so that the blank sample is representative of clean non-dedicated equipment to be used for sampling.

The collection procedure for collecting rinsate blanks for all analytes is as follows:

1. Pour or pump "analyte-free" water over or into representative equipment.
2. Transfer water to sample bottles for analysis.
3. Preserve rinsate blank samples, as necessary, in accordance with SOP No. 8 – Containers, Preservatives, Handling, and Tracking of Samples for Analysis.

2.4.3 Equipment Blanks

The term equipment blank is for the blank sample that will be collected in the laboratory from the LSM separate equipment in accordance with procedures identified in SOP No. L-24 – LSM Bulk Sample Filtration. The equipment blank sample will consist of LSM particulate equipment blank and LSM dissolved equipment blanks sample and will be submitted for analysis.

3. Quality Assurance

Decontamination quality assurance/quality control procedures will be performed to assess the adequacy of equipment decontamination procedures. Equipment and rinsate blanks will be collected at a frequency specified in the Combined Sewer Overflow/Stormwater Outfall Investigation Quality Assurance Project Plan.

4. Documentation

Field personnel are responsible for documenting decontamination activities related to their on-site activities in accordance with SOP No. 7 – Field Documentation. In addition to this, the following information should also be included in the logbook (at a minimum):

- ☐ Information concerning items decontaminated and the procedure utilized.
- ☐ Information related to the collection of equipment and rinsate blank samples.

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5. References

Tierra. 2010. Health and Safety Plan. Lower Passaic River Study Area CSO/SWO Investigation. Tierra Solutions, Inc. East Brunswick, New Jersey. Revision 0. July 2010.

USEPA. 1989. Comprehensive Environmental Response, Compensation, and Liability Act Quality Assurance Manual, Revision 1. October.

USEPA. 1996. Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels. Method 1669. July.

**Standard Operating Procedure
No. 7**

Field Documentation

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1. Purpose and Scope

The purpose of this document is to define the standard operating procedure (SOP) for documentation of field activities and measurements. Appropriate documentation of field activities provides an accurate and comprehensive record of the work performed, sufficient for a technical peer to reconstruct the day's activities and determine that necessary requirements were met.

This SOP may change depending upon field conditions or limitations imposed by the procedure. Substantive modification to this SOP will be approved in advance by Tierra Solutions, Inc.'s (Tierra's) Project Coordinator and the U.S. Environmental Protection Agency (USEPA) Remedial Project Manager and On-Scene Coordinator.

Other SOPs will be utilized in conjunction with this procedure, including:

- ☐ SOP No. 1 – Field Reconnaissance
- ☐ SOP No. 2 – Pre-Mobilization
- ☐ SOP No. 3 – Mobilization, Bulk Sample Collection, and Transportation
- ☐ SOP No. 4 – Sample Processing and Collection
- ☐ SOP No. 5 – Metals Sampling via Method 1669 Sampling Ambient Water for Trace Metals at USEPA Water Quality Criteria Levels (USEPA 1996)
- ☐ SOP No. 6 – Decontamination
- ☐ SOP No. 8 – Containers, Preservation, Handling, and Tracking of Samples for Analysis
- ☐ SOP No. 9 – Management and Disposal of Residuals
- ☐ SOP No. 10 – Data Management.

2. Procedures

In instances where this SOP will be utilized, a hard copy or electronic version will be available at the point of use.

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2.1 General Requirements

Pertinent field information will be recorded in a logbook and/or an appropriate form (as described herein) with a black, ballpoint pen. The field forms are included as an attachment to this SOP. Field form entries may be recorded on hard copy forms or electronically in a field database. (Attached forms do not include Sample Delivery Group [SDG] Tracking Logs or Chain of Custody Forms, as these are provided in SOP No. 8 – Containers, Preservation, Handling, and Tracking of Samples for Analysis.) A key that describes each entry is provided for each form. Logbook entries will be factual and observational (i.e., no speculation or opinion) and will not contain any personal information or non-project-related entries. Separate and dedicated logbooks will be kept for different operations running concurrently; individual tasks making up each operation will be maintained in the same logbook, if possible. The cover and binding of each logbook will be labeled to identify the operation and dates included within the logbook; each page in the logbook will be consecutively numbered.

A page header will appear on the first page of each day's notes in the logbook, and activities for each day will be recorded on a new page. The page header will include:

- ☐ name of author and other personnel on site (and affiliated organization if applicable)
- ☐ date
- ☐ time of arrival
- ☐ current weather conditions
- ☐ weather forecast for the day.

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An abbreviated header, limited to the date, will appear at the top of each additional page for the active date.

Field activities and other events pertinent to the field activities not included on the field forms will be documented in chronological order. Times will be recorded using 24-hour notation for each entry. At a minimum, documentation in a logbook will include the following:

- ☐ names of visitor(s) to the work location, including time of arrival and departure, the visitor's affiliation, and reason for visit

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- ☐ summary of project-related communications, including names of people involved and time
- ☐ time that daily work commences and ceases
- ☐ start and stop times of each task
- ☐ start and stop times of breaks
- ☐ safety or other monitoring data, including units with each measurement
- ☐ deviations from scope of work
- ☐ progress updates
- ☐ problems/delays encountered
- ☐ unusual events
- ☐ signature or initials of author on every page.

A single line will be drawn through incorrect entries and the corrected entry written next to the original strikeout. Strikeouts are to be initialed and dated by the original author.

If there are additional lines on the page at the end of the day's activities, a line will be drawn through the empty space, initialed, and dated, leaving no room for additional entries.

The logbook will supplement information documented in the field forms.

Photographs will be identified in the logbook by a unique numbering system. If photographs are collected by a digital camera, the file number, as well as the photograph number, will accompany the description of the photograph in the logbook. At a minimum, the time the photograph was taken, the general location, a brief description, and the photographer's name will be recorded. Additional information may include differential global positioning system coordinates, direction the photographer was facing, and/or weather conditions. If necessary, an object will be included in the photograph to indicate the scale of the object(s) in the photograph.

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2.2 Field Activity-Specific Requirements

This section presents specific documentation requirements for activities to be performed. It is meant to provide guidance to project staff responsible for field documentation during these activities and is not intended to be a comprehensive list of activities performed. These documentation procedures are meant to supplement, not replace, the required documentation.

Three field forms (attached) were developed to assist in documenting field information in a consistent manner. The purpose of each form is described below:

- ☐ *Daily Log* – Summarizes daily activities, including personnel present, equipment used, and weather conditions during bulk sample collection. One Daily Log will be completed for days where equipment setup, bulk sample collection, and sampling processing activities are performed.
- ☐ *Bulk Sample Collection Form* – Summarizes bulk sample collection at each sampling location. Provides collection-specific information and serves as the chain of custody for the bulk sample water.
- ☐ *Sample Processing Form* – Summarizes sample processing and collection information for each sample collected for laboratory analysis.

2.2.1 Equipment Decontamination

Documentation of decontamination procedures will be contained in a logbook and will include a list of equipment being decontaminated, the time of decontamination, a brief description of the procedure and materials used during the process, and the names of the project staff performing the decontamination. Documentation of quality assurance (QA) samples (e.g., equipment blanks), when collected, will include the information specified in SOP No. 6 – Decontamination.

2.2.2 Equipment Calibration and Maintenance

Equipment calibration will be recorded in the equipment calibration log (attached). Instrument information, including the instrument manufacturer, model number, and serial number, will be recorded. Instrument calibration will be performed in accordance with manufacturer's specifications and CSO/SWO Investigation QAPP. Values measured during calibration will be recorded in the equipment calibration log. In addition, maintenance problems and repairs to the equipment will be recorded in the equipment calibration log.

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2.2.3 Bulk Sample Collection

Documentation of sample collection will be recorded in the Daily Log and the Bulk Sample Collection Form, both of which are attached to this SOP. Upon arrival at, and departure from, the 80 Lister Avenue site, personnel are required to record an entry in the Employee and Visitor Log also attached to this SOP.

Additional information that will be considered for entry into the logbook includes:

- ☐ date and time (bulk sample collection)
- ☐ names of the members of the crew
- ☐ location ID and sample IDs
- ☐ sample collection equipment, and sample observations
- ☐ QA samples (matrix spike/matrix spike duplicate [MS/MSD], MS/duplicate, and field duplicates, if needed).

Deleted: Once bulk samples are stored in a refrigeration unit, entries in a Refrigeration Unit Sign-In/Sign-Out Form (attached) are to be completed with each addition or removal of samples from the unit.

2.2.4 Sample Processing

Documentation of sample processing will be recorded in the Daily Log and the Sample Processing Form, which are attached to this SOP. Upon arrival at, and departure from, the 80 Lister Avenue site, personnel are required to record an entry in the Employee and Visitor Log also attached to this SOP.

Additional information that will be considered for entry into the logbook includes:

- ☐ date and time (individual sample collection and individual sample processing)
- ☐ names of the members of the processing crew
- ☐ location ID
- ☐ preservative (if necessary)
- ☐ processing procedures, equipment, and sample observations
- ☐ QA samples (MS/MSD, MS/duplicate, and field duplicates, if needed).

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Sample information should be included in a logbook, as well as on the Chain of Custody Form and SDG Tracking Log (see SOP No. 8 – Containers, Preservation, Handling, and Tracking of Samples for Analysis) and sample container label.

2.2.5 Sample Handling and Shipping Procedures

Activities associated with the handling and shipping of samples will be recorded in a logbook. In addition to meeting the general requirements described in Section 2.1 of this SOP, sample handling and shipping documentation will include:

- ☐ date and time sample custody was relinquished
- ☐ organization/representative receiving custody
- ☐ name of analytical laboratory
- ☐ shipment tracking number (if using commercial shipping company)
- ☐ SDG tracking log number (for internal tracking purposes).

2.3 Distribution and Maintenance of Field Documentation

Logbooks that are taken off site from the field offices will be photocopied and filed at the end of each day to mitigate against the loss of historical entries should the logbook be lost or damaged in the field.

Field data forms and chain of custody/SDG tracking logs will be filed once they have been completed and distributed (if necessary), or at the end of each field day.

The distribution of daily forms will be performed according to the needs of the project team and at the direction of Tierra's Project Coordinator or their designee.

Upon completion of sampling and transfer of samples to the shipping company or courier, copies of the signed chains of custody and SDG tracking logs will be emailed to Tierra's Project Coordinator, appropriate analytical laboratory contacts, and the Quality Assurance Coordinator. Copies of these documents will also be maintained at the field office in a labeled three-ring binder in reverse chronological order.

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3. Quality Assurance

Entries in the field forms (i.e., Daily Log, Bulk Sample Collection Form, and Sample Processing Form) will be confirmed by the samplers to verify that the information is

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correct. Completed field forms will be reviewed periodically by Tierra's Project Coordinator and/or the Project Quality Assurance Officer, or their designees, to verify that the sampling and processing requirements are being met.

4. References

USEPA. 1996. Method 1669, Sampling Ambient Water for Trace Metals at EPA Water Criterion Levels, U.S. Environmental Protection Agency, Office of Water Engineering and Analysis Division (4303), July 1996.

DAILY LOG
CSO/SWO INVESTIGATION
(Sheet 1 of 1)

I.	Date: _____ (1)																																	
II.	Task (Select tasks to be performed today): _____ (2) <input type="checkbox"/> Equipment Setup <input type="checkbox"/> Bulk Sample Collection <input type="checkbox"/> Sample Processing																																	
III.	Personnel (Name/Affiliation/Task): _____ (3) _____ _____ _____																																	
IV.	<div style="display: flex;"> <div style="flex: 1;"> Equipment: DGPS: Pump (1): Pump (2): Pump (3): Water Quality Meter: Five-Gas Meter: Other: Other: </div> <table border="1" style="flex: 3; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Name/Type</th> <th style="text-align: center;">Model No.</th> <th style="text-align: center;">Serial No.</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">(4)</td> <td style="text-align: center;">(5)</td> <td style="text-align: center;">(6)</td> </tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> </tbody> </table> </div>	Name/Type	Model No.	Serial No.	(4)	(5)	(6)																											
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VI.	Health and Safety Briefing Topic: _____ (8) _____ _____ _____																																	
VII.	Notification: <table border="1" style="margin-left: 20px; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Agency</th> <th style="text-align: center;">Contact</th> <th style="text-align: center;">Date/Time (24-hour)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">(9)</td> <td style="text-align: center;">(10)</td> <td style="text-align: center;">(11)</td> </tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> </tbody> </table>	Agency	Contact	Date/Time (24-hour)	(9)	(10)	(11)																											
Agency	Contact	Date/Time (24-hour)																																
(9)	(10)	(11)																																
VIII.	Name of Person Responsible for this Form: _____ (12) _____																																	

DAILY LOG KEY
CSO/SWO INVESTIGATION
(Sheet 1 of 1)

This Daily Log is to be completed, in addition to entries within the field logbooks, for each day where equipment setup, bulk sample collection, or sample processing events are conducted.

DESCRIPTION OF ITEMS:

- (1) Date of activity (e.g., 1/1/2011).
- (2) Select task to be performed for this form.
- (3) Sampling personnel on site, including name, affiliation, and which tasks (i.e., equipment setup, bulk sample collection, or sample processing) personnel are participating in.
- (4) Name or type of equipment (e.g., for differential global positioning system [DGPS], enter Trimble); if specific equipment type not listed, enter under "Other."
- (5) Model number of equipment (e.g., for DGPS, enter 7400).
- (6) Serial number of equipment (if available).
- (7) Weather forecast checked (e.g., Newark Liberty International Airport) and description of weather forecast for the day.
- (8) Significant topic(s) discussed at daily health and safety briefing.
- (9) Name of the agency(ies) notified of daily activities.
- (10) Agency(ies) contact name(s).
- (11) Time that the agency(ies) was(were) contacted (24-hour format).
- (12) Name of the person entering information into this form.

BULK SAMPLE COLLECTION FORM
CSO/SWO INVESTIGATION
(Sheet 1 of 3)

I.	Date: _____ (1)	Arrival Time: _____ (2)	Departure Time: _____ (3)																
II.	Location ID: _____ (4)																		
III.	Description: _____ (5)																		
IV.	<div style="display: flex; justify-content: space-between;"><div>Weather During Bulk Sample Collection:</div><div style="display: flex; width: 100%;"><div style="width: 45%; text-align: center;">Start of Collection</div><div style="width: 45%; text-align: center;">End of Collection</div></div></div> <table border="1" style="width: 100%; border-collapse: collapse;"><tr><td style="width: 45%;">Wind Speed/Direction:</td><td style="width: 45%; text-align: center;">(6)</td><td style="width: 10%;"></td><td style="width: 40%;"></td></tr><tr><td>Temperature:</td><td style="text-align: center;">(7)</td><td></td><td></td></tr><tr><td>Precipitation:</td><td style="text-align: center;">(8)</td><td></td><td></td></tr><tr><td>Cloud Cover:</td><td style="text-align: center;">(9)</td><td></td><td></td></tr></table>			Wind Speed/Direction:	(6)			Temperature:	(7)			Precipitation:	(8)			Cloud Cover:	(9)		
Wind Speed/Direction:	(6)																		
Temperature:	(7)																		
Precipitation:	(8)																		
Cloud Cover:	(9)																		
V.	<div>Initial Air Monitor Readings:</div> <div style="margin-top: 10px;">Oxygen (%): _____ (10)</div> <div style="margin-top: 5px;">CO (ppm): _____ (11)</div> <div style="margin-top: 5px;">LEL (%): _____ (12)</div> <div style="margin-top: 5px;">H₂S (ppm): _____ (13)</div> <div style="margin-top: 5px;">VOC (ppm): _____ (14)</div> <div style="margin-top: 10px;"><small><i>Personnel will not enter confined spaces of any type unless it is absolutely necessary. If it becomes necessary to enter a manhole, refer to the procedures listed in the project Health and Safety Plan and the action levels listed below.</i></small></div> <div style="margin-top: 5px;">Confined Space Entry Action Levels:</div> <div style="margin-top: 5px;"><small> Oxygen content for all confined space entry must be 19.5 to 23.5% (oxygen must be measured first).</small></div> <div style="margin-top: 5px;"><small> Combustible gas or vapor must not exceed 10% of its LEL.</small></div> <div style="margin-top: 5px;"><small> Toxic gas or vapor must not exceed 50% of the Occupational Safety and Health Administration's permissible exposure limit or other published exposure guidelines, whichever is lower.</small></div> <div style="margin-top: 5px;"><small> CO must not exceed 10 ppm.</small></div> <div style="margin-top: 5px;"><small> H₂S must not exceed 0.5 ppm.</small></div>																		
VI.	Name of Person Responsible for this form: _____ (15)																		
VII.	<div>Relinquished By: _____ (16) Company: _____ (17) Date: _____ (18) Time: _____ (19)</div> <div>Accepted By: _____ (20) Company: _____ (21) Date: _____ (22) Time: _____ (23)</div>																		

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BULK SAMPLE COLLECTION FORM
CSO/SWO INVESTIGATION
(Sheet 2 of 3)

VIII.	Date (Sample Date): _____ (1)		If measured: Initial Water Depth (ft): _____ (24)					
	Location ID: _____ (4)		Initial Water Velocity (fps): _____ (25)					
	<small>Note: Sample date is the date of bulk sample collection (i.e., date of overflow event).</small>							
IX.	Observed Overflow: Start Time: _____ (26)		Overflow End Time: _____ (27)					
	Bulk Sample Collection: Bulk Sample Start Time: _____ (28) Bulk Sample End Time (Sample Time): _____ (29) Bulk Sample Collection Duration (min): _____ (30)		Bulk Sample Collection Stoppage Times (min): Stop/Start Times and Reason for Stoppage: _____ (31)					
X.	TSS Sample Collection/Water Quality Monitoring							
	TSS Sample Time	Flow Rate (gpm)	Temperature (°F)	Turbidity (NTU)	Conductivity (mS/cm)	TSS Sample ID (if applicable)	Notes	
	(32)	(33)	(34)	(35)	(36)	(37)		
<small>Note: TSS samples will be collected every 30 minutes beginning 15 minutes following the start of bulk sample collection. Water quality measurements will be recorded every 15 minutes.</small>								
XI.	LSM and Whole Water Bulk Sample Collection							
	Estimated Flow Rate (gpm): _____ (38)							
	Estimate of Total Volume Collected (gal): _____ (39)							
	Observations: _____ (40)							

BULK SAMPLE COLLECTION FORM
CSO/SWO INVESTIGATION
(Sheet 3 of 3)

XII.	HSM Dissolved Bulk Sample Collection	
	Total Effluent Volume (gal) Recorded by the In-Line Flow Meter:	(41)
	Estimated Effluent Volume (gal) Passed through CFC:	(42)
	Estimated Flow Rate to CFC (gpm):	(43)
	Estimated Flow Rate (gpm) to HSM Dissolved Bulk Sample Collection Tank:	(44)
	Estimated Total Volume (gal) Collected in HSM Dissolved Bulk Sample Collection Tank:	(45)
	Calculated Volume (gal) Collected in HSM Dissolved Bulk Sample Collection Tank:	(46)
	Observations:	(47)
XIII.	USEPA Method 1669 Grab Metals and TSS Sample Collection	
	Whole Water Sample ID:	(48)
		Time Collected: (49)
Note: Grab metals samples will be collected and processed at the sample collection location (see SOP No. 5). Grab metals collection will be initiated approximately 1.5 hours after start of bulk sample collection.	Dissolved Sample ID:	(50)
		Time Collected: (51)
	TSS Sample ID:	(52)
		Time Collected: (53)
	Observations:	(54)

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CSO/SWO INVESTIGATION
(Sheet 3 of 3)

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BULK SAMPLE COLLECTION FORM KEY
CSO/SWO INVESTIGATION
(Sheet 1 of 3)

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This Bulk Sample Collection Form is to be completed, in addition to entries within the field logbooks, for each bulk sample collection event.

DESCRIPTION OF ITEMS:

- (1) Date of bulk sample collection (e.g., 1/1/2011).
- (2) Start time of activities at location (24-hour format).
- (3) End time of activities at location in (24-hour format).
- (4) Location ID.
- (5) Physical description of the bulk sample collection location, including location coordinates; record any unusual conditions.
- (6) Wind speed and direction at the beginning and end of bulk sample collection event (e.g., 10 to 15 miles per hour from northwest).
- (7) Air temperature at the beginning and end of bulk sample collection event (e.g., 68 degrees Fahrenheit).
- (8) Precipitation at the beginning and end of bulk sample collection event (e.g., light rain).
- (9) Cloud cover at the beginning and end of bulk sample collection event (e.g., partly cloudy).
- (10) Oxygen percentage upon opening manhole.
- (11) Carbon monoxide (CO) concentration (in parts per million [ppm]) upon opening the manhole.
- (12) Combustable gas measurement reported as a percentage of its lower explosive limit (LEL) upon opening the manhole.
- (13) Hydrogen sulfide (H₂S) concentration (ppm) upon opening the manhole.
- (14) Volatile organic compound reading (ppm) upon opening the manhole.
- (15) Name of the person entering information into this form.
- (16) Name of personnel relinquishing collected bulk sample water.
- (17) Company affiliation of personnel relinquishing collected bulk sample water.
- (18) Date that collected bulk sample water is relinquished.
- (19) Time that collected bulk sample water is relinquished (24-hour format).
- (20) Name of personnel accepting bulk sample water at the sample processing facility.
- (21) Company affiliation of personnel accepting bulk sample water at the sample processing facility.
- (22) Date bulk sample water is accepted at the sample processing facility.
- (23) Time bulk sample water is accepted (24-hour format) at the sample processing facility.

BULK SAMPLE COLLECTION FORM KEY
CSO/SWO INVESTIGATION
(Sheet 2 of 3)

(24) Depth of water in manhole or stormwater outfall access point in feet (ft) (if measured).

(25) Water velocity (in feet per second [fps]) flowing through the manhole (if measured).

(26) Time that overflow event starts (if observed).

(27) Time that overflow event ends (if observed).

(28) Time that the main pump is turned on for bulk sample collection.

(29) Time that the main pump is turned off for bulk sample collection.

(30) Duration of bulk sample collection (in minutes). Calculate from the difference between the bulk sample collection start time (line item 28) and end time (line item 29).

(31) Start and stop times and reasoning for main pump being turned off (e.g., due to tubing clog).

(32) Time that integrated total suspended solids (TSS) sample(s) were collected.

(33) Manually measured flow rate estimate (in gallons per minute [gpm]) of bulk sample water flowing through the TSS sample port.

(34) Bulk sample water temperature (in degrees Fahrenheit), as measured using an in-line water quality meter.

(35) Turbidity (in Nephelometric Turbidity Units [NTU]) in bulk sample water, as measured using an in-line water quality meter.

(36) Bulk sample water conductivity (in millisiemens per centimeter [mS/cm]), as measured using an in-line water quality meter.

(37) TSS sample ID.

(38) Flow rate (in gpm) of effluent water flowing into the whole water/low-solids mass (LSM) bulk sample collection tank measured using the small-diameter sampling pumps.

(39) Total volume in liters (in gal) of LSM and whole water bulk sample collected in the designated tank.

(40) Observations of collected whole water/LSM bulk sample water (e.g., color, turbidity, odor).

(41) Record total effluent volume (in L) passed through the in-line flow meter.

(42) Estimated total effluent volume (in gal) passed through the CFC during bulk sample collection. Calculate by adding the total volume measured using the in-line flow meter (line item 41) and volume of effluent collected in the HSM dissolved bulk sample collection tank (line item 45).

(43) Estimated flow rate (in gpm) to the CFC. Calculated by dividing the total volume (in gal) of effluent passed through CFC (line item 42) and sample collection duration (line item 30).

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¶
<#>Time the Water Quality Meter (WQM) is turned off following water quality measurements.¶

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Deleted: <#>Dissolved oxygen (DO) concentration (in milligrams per liter [mg/L]) in bulk sample water, as measured using an in-line water quality meter.¶

Deleted: pH of bulk sample water, as measured using an in-line water quality meter.

Deleted: <#>Oxidation-reduction potential (ORP; in millivolts [mV]).¶

Deleted: <#>Time that the whole water/low solids mass (LSM) and high solids mass (HSM) dissolved tank sample peristaltic pumps are turned on for bulk sample collection.¶

¶
<#>Time that the whole water/LSM and HSM dissolved tank sample peristaltic pumps are turned off for bulk sample collection.¶

¶
Manually measured f

Deleted: Manually measured flow rate (in gpm) of effluent water flowing into the HSM dissolved bulk sample collection tankTotal volume in liters (in gal) of HSM dissolved bulk sample collected in the designated tank.¶

BULK SAMPLE COLLECTION FORM KEY
CSO/SWO INVESTIGATION
(Sheet 3 of 3)

- (44) Flow rate (in gpm) of effluent water flowing into the high-solids mass (HSM) dissolved bulk sample collection tank measured using the small-diameter sampling pumps.
- (45) Total volume (gal) of HSM dissolved bulk sample collected in the designated tank.
- (46) The volume collected in the HSM dissolved tank calculated as the average flow rate multiplied by the duration of flow.
- (47) Observations of collected HSM dissolved bulk sample water (e.g., color, turbidity, odor).
- (48) Whole water sample ID for grab trace metals.
- (49) Time of whole water sample collection for trace metals.
- (50) Dissolved sample ID for trace metals.
- (51) Time of dissolved sample collection for trace metals.
- (52) TSS sample ID from grab metals collection stream.
- (53) Time of TSS sample collection from grab metals collection stream.
- (54) Observations of collected sample water for trace metals samples (e.g. color, turbidity, odor).

Deleted: Observations of collected HSM dissolved bulk sample water (e.g., color, turbidity, odor).

Deleted: Recorded total effluent volume (in L) passed through the in-line flow meter.

Deleted: Estimated total effluent volume (in gal) passed through the CFC during bulk sample collection. Calculate by adding the total volume measured using the in-line flow meter (line item 40) and volume of effluent collected in the HSM dissolved bulk sample collection tank (line item 44).

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Deleted: <#>CFC operating speed measured/recorded using the variable flow drive (VFD) in the trailer.¶

SAMPLE PROCESSING FORM
CSO/SWO INVESTIGATION
(Sheet 1 of 2)

I.	Date of Bulk Sample Collection (<u>Sample Date</u>): _____ (1) <small>Note: Sample date is the date of bulk sample collection (i.e., date of overflow event).</small>	
II.	Date of Sample Processing: _____ (2) <small>Note: Sample processing date will be the day after the bulk sample collection date. Samples are to be shipped/transported to laboratories the day after bulk collection.</small>	
III.	Location ID: _____ (3)	
IV.	Whole Water Samples: Sample ID: _____ (4) Time of collection: _____ (5) Analytical Hierarchy Used? _____ (6) List Sample Analyses if hierarchy is applied: _____ (7) _____ <small>Note: Perform residual chlorine test for whole water/LSM bulk samples and add sodium thiosulfate, if necessary.</small>	
V.	LSM Bulk Sample: LSM Bulk ID: _____ (8) Time of collection: _____ (9) Analytical Hierarchy Used? _____ (10) List Sample Analyses if hierarchy is applied: _____ (11) _____ <small>Note: LSM bulk ID is an interim ID for transport of the LSM bulk material to the laboratory where it will be separated by the laboratory to generate LSM particulate and LSM dissolved samples for analysis.</small>	
VI.	HSM Dissolved Samples: Sample ID: _____ (12) Time of collection: _____ (13) Analytical Hierarchy Used? _____ (14) List Sample Analyses if hierarchy is applied: _____ (15) _____ <small>Note: Add sodium thiosulfate (if necessary) based on the results of the residual chlorine test performed for the LSM bulk/whole water sample.</small>	
VII.	HSM Particulate Samples: Sample ID: _____ (16) Time of collection: _____ (17) <u>Description of Material</u> _____ (18) Total Mass of <u>fine Solids</u> Collected in CFC (g): _____ (19) Total Mass of <u>non-fine Solids</u> (if encountered) Collected in CFC (g): _____ (20) List Sample Analyses if hierarchy is applied: _____ (21) _____ <small>Note: Add sodium thiosulfate (if necessary) based on the results of the residual chlorine test performed for the LSM bulk/whole water sample.</small>	
VIII.	Name of person responsible for this form: _____ (22)	

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SAMPLE PROCESSING FORM KEY
CSO/SWO INVESTIGATION
(Sheet 1 of 1)

This Sample Processing Form is to be completed, in addition to entries within the field logbooks, for each sample processing event.

DESCRIPTION OF ITEMS:

- (1) Date of bulk sample collection (as recorded on the Bulk Sample Collection Form).
- (2) Date of sample processing (e.g., 1/1/2011).
- (3) Location ID (as recorded on the Bulk Sample Collection Form).
- (4) Whole water sample ID.
- (5) Time of whole water sample collection. Note that Time of Collection will be the time the main pump is stopped during bulk sample collection.
- (6) Indicate "yes" or "no" if an analytical hierarchy was used due to a lack of sample volume or mass.
- (7) List the analytical groups that will be tested for if an analytical hierarchy is applied.
- (8) LSM bulk material ID.
- (9) Time of LSM bulk material sample collection. Note that Time of Collection will be the time the main pump is stopped during bulk sample collection.
- (10) Indicate "yes" or "no" if an analytical hierarchy was used to a lack of sample volume or mass.
- (11) List the analytes that will be tested for if an analytical hierarchy is applied.
- (12) High-solids mass (HSM) dissolved sample ID.
- (13) Time of HSM dissolved sample collection. Note that Time of Collection will be the time the main pump is stopped during bulk sample collection.
- (14) Indicate "yes" or "no" if an analytical hierarchy was used due to a lack of sample volume or mass.
- (15) List the analytes that will be tested for if an analytical hierarchy is applied.
- (16) HSM particulate sample ID.
- (17) Time of HSM particulate sample collection. Note that Time of Collection will be the time the main pump is stopped during bulk sample collection.
- (18) Physical description of solid material.
- (19) Total mass of fine solids collected in grams from the continuous flow CFC bowl.
- (20) Total mass of non-fine solids (if encountered) collected in grams from the continuous flow CFC bowl
- (21) Indicate "yes" or "no" if an analytical hierarchy was used due to a lack of sample volume or mass.
- (22) List the analytes that will be tested for if an analytical hierarchy is applied.
- (23) Name of the person responsible for entering information into this form.

Date _____

[illegible]

Equipment Calibration and Maintenance Log

Date (mm/dd/yy)	Time (hh:mm)	Equipment Information		Calibration ^a			Inspection ^b		Maintenance ^c	
		Make/Model	ID/Serial Number	Initial	Check	Recalibrate	Working	Replace	Charge	Repair ^d

Notes:
^a Enter the time of each activity.
^b Enter initials in appropriate box during each calibration activity, if REPLACE, record the reason on the following line and calibrate new equipment.
^c Enter initials in appropriate box upon performing any of the listed activities.
^d Enter description of repair activity in logbook.

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Date/Time ... [2]

Standard Operating Procedure No. 8

Containers, Preservation, Handling, and Tracking of Samples for Analysis

August 2013

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Revision 3

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~~August 2013~~

Revision 3

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Attachments

Pre-Printed Sample Label

Chain of Custody Form

SDG Tracking Log

Custody Seal

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1. Purpose and Scope

The purpose of this document is to define the standard operating procedure (SOP) for containerizing, preserving, handling, tracking, and shipping samples. Samples for this investigation include effluent or solids collected for chemical analysis and associated quality assurance analyses.

This SOP is intended to be complete enough so that sampling personnel following these procedures will deliver samples to the laboratory that are equally reliable and consistent, and in compliance with regulatory agency requirements and the standards established in the Combined Sewer Outfall/Stormwater Overflow Investigation Quality Assurance Project Plan (CSO/SWO Investigation QAPP).

This SOP may change depending on field conditions, equipment limitations, or limitations imposed by the procedure. Substantive modification to this SOP will be approved in advance by the Investigative Organization and the U.S. Environmental Protection Agency (USEPA) Remedial Project Manager and On-Scene Coordinator.

Other SOPs will be utilized with this procedure, including:

- ☐ SOP No. 3 – Mobilization, Bulk Sample Collection, and Transportation
- ☐ SOP No. 4 – Sample Processing and Collection
- ☐ SOP No. 5 – Metals Sampling via Method 1669 Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels (USEPA 1996)
- ☐ SOP No. 6 – Decontamination
- ☐ SOP No. 7 – Field Documentation
- ☐ SOP No. 9 – Management and Disposal of Residuals.

2. Procedures

2.1 Equipment List

The following equipment list contains equipment and supplies that may be needed in carrying out the procedures contained in this SOP. Not all equipment/supplies listed below may be necessary for a specific activity. Additional equipment/supplies may be required, pending field conditions:

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☐ personal protective equipment and other safety equipment, as required in the project Health and Safety Plan (Tierra Solutions, inc. [Tierra], 2010)

☐ packing material (e.g., foam peanuts, vermiculite, cardboard)

☐ sample containers

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chlorine ST()

☐ sample labels

Deleted: nitric acid

☐ chain of custody

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Deleted: pipette

☐ sample delivery group (SDG) tracking logs

☐ ice chest(s)

☐ custody seals

☐ indelible marking pens

☐ shipping tape

☐ sealable plastic bags

☐ temperature blanks (if not provided by the laboratory)

☐ logbook

☐ ice or similar chilling source

☐ spatula

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☐ Hach® chlorine test strips

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☐ sodium thiosulfate (anhydrous reagent grade)

☐ plastic lining material

☐ clear tape

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☐ small-capacity analytical balance (Ohaus SP 602 or similar), with an accuracy of at least 0.01 grams (10 milligrams) and capacity of 600 grams and a large-capacity balance (Ohaus ES100L or similar) with reading capacity of minimum 5,000 grams.

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- calibration/verification weight (500 grams).

2.2 Identification Codes and Labeling

2.2.1 Low-Solids Mass Bulk Sample Identification Code

The low-solids mass (LSM) bulk material collected from the whole water/LSM bulk sample collection tank will be assigned an interim identification code ("LB") for transporting the LSM bulk sample to the laboratory. Once at the laboratory, the LSM bulk material will be filtered in accordance with SOP No. L-24 – LSM Bulk Sample Filtration to generate LSM particulate and LSM dissolved samples for analysis.

The complete list of sample identification codes are provided as part of Worksheet #18 of the CSO/SWO Investigation QAPP. The identification code for the LSM bulk sample will consist of a unique 14-character string used to identify the LSM bulk sample for transportation and subsequent laboratory filtration:

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- Characters 1 and 2: Two characters to describe the regional location where the sample was collected. This will be "PR" for lower Passaic River.
- Character 3: One digit to describe the program phase during which the sample was collected (i.e., "1" for Phase I and "2" for Phase II).
- Characters 4, 5, and 6: Three characters to describe the sample type. This will be "CSO", "SWO", and "POT" (for publically owned treatment works).
- Characters 7, 8, and 9: Three characters to describe the sampling location. For example, "VER" for Verona Avenue (see Worksheet #18).
- Characters 10 and 11: Two characters to describe the sample matrix. This will be "LB" for LSM bulk sample.
- Characters 12 and 13: A two-digit number (preceded by a hyphen) to describe the sequence of the sampling event (either the first, 01, or second, 02) at the specified location.
- Character 14: One character to describe the sampling attempt. "A" will be used for the first attempt, "B" for the second attempt, and "C" for a third attempt.

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2.2.1.1 Example of Low-Solids Mass Bulk Sample Identification Code

The following is an example of a LSM bulk sample identification number:

PR2CSOVERLB-01A

Explanations:

- ☐ The sample was collected in the Passaic River as part of the CSO investigation.
- ☐ The sample was the second phase of the CSO investigation.
- ☐ The sample was collected from a CSO.
- ☐ The sample was collected at the Verona Avenue location.
- ☐ The sample matrix was LSM bulk sample material.
- ☐ The sample was the first sample collected for this location.
- ☐ This was the first collection attempt for this sample.

2.2.2 Sample Identification Code

The complete list of sample identification codes are provided as part of Worksheet #18 of the CSO/SWO Investigation QAPP.

The standard sample identification number will consist of a unique 14- or 15-character string used to identify each sample collected and submitted to the laboratories for analysis, as follows:

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- Characters 1 and 2: Two characters to describe the regional location where the sample was collected. This will be "PR" for lower Passaic River.
- Character 3: One digit to describe the program phase during which the sample was collected (i.e., "1" for Phase I and "2" for Phase II).
- Characters 4, 5, and 6: Three characters to describe the sample type. This will be "CSO", "SWO", and "POT" (for publically owned treatment works).

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Characters 7, 8, and 9: Three characters to describe the sampling location. For example, "VER" for Verona Avenue.

Characters 10 and 11: Two characters to describe the sample matrix. This will be "WW" for whole water, "GD" for grab dissolved (field-filtered for metals), "GW" for grab whole water, "LD" for LSM dissolved, "LP" for LSM particulates, "HD" for high-solids mass (HSM) dissolved, and "HP" for HSM particulates. ("LP" and "LD" samples will be generated in the laboratory from LSM bulk sample "LB" in accordance with SOP No. 24 – LSM Bulk Sample Filtration.)

Characters 12 and 13: A two-digit number (preceded by a hyphen) to describe the sequence of the sampling event (either the first, 01, or second, 02) at the specified location.

Character 14: One character to describe the sampling attempt. "A" will be used for the first attempt, "B" for the second attempt, and "C" for a third attempt.

Character 15: One character to describe the HSM particulate fraction as two HSM particulate fractions may be encountered (e.g., fine material and non-fine material). "1" will be used for the fine fraction and "2" will be used for the non-fine (e.g., paper-like) fraction. A physical description of the fractions will be recorded in accordance with SOP 7.

2.2.2.1 Location Identifier

Location IDs are pre-assigned and are represented by the first nine digits described above. The location ID and location information will be recorded on the Bulk Sample Collection Form and the Sample Processing Form (see SOP No. 7 – Field Documentation).

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2.2.2.2 Example of Sample Identification Code

The following is an example of a sample identification number:

PR2CSOVERWW-01A1

Explanations:

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- ☐ The sample was collected in the Passaic River as part of the CSO investigation.
- ☐ The sample was the second phase of the CSO investigation.
- ☐ The sample was collected from a CSO.
- ☐ The sample was collected at the Verona Avenue location.
- ☐ The sample matrix was whole water.

☐ The sample was the first sample collected for this location.

☐ This was the first collection attempt for this sample.

The following is an additional example of a sample identification number for HSM particulate sample in the event that two HSM particulate fractions are encountered:

PR2CSOVERHP-01A1

Explanations:

- ☐ The sample was collected in the Passaic River as part of the CSO investigation.
- ☐ The sample was the second phase of the CSO investigation.
- ☐ The sample was collected from a CSO.
- ☐ The sample was collected at the Verona Avenue location.
- ☐ The sample matrix was HSM particulate.
- ☐ The sample was the first sample collected for this location.
- ☐ This was the first collection attempt for this sample.
- ☐ This sample was collected for the fine fraction of the HSM particulate solids.

2.2.3 Sample Delivery Group Number Identification Code

The standard SDG number will consist of a unique five-character string used to identify each SDG submitted to the laboratories for analysis, as follows:

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- Characters 1 and 2: Two characters to describe the regional location where the sample was collected. This will be "PR" for lower Passaic River.
- Character 3: One digit to describe the program phase during which the sample was collected (i.e., "1" for Phase I and "2" for Phase II).
- Characters 4 and 5: A two-digit number to describe the SDG, sequentially numbered beginning with 01 up to 99.

Following is an example of an SDG number:

PR201

Explanation:

- The SDG was the first SDG from Phase II submitted to the laboratory for analysis.

2.2.4 Quality Assurance Sample Identification Code

2.2.4.1 Field Duplicates

Duplicate samples will be labeled by a unique ~~11~~ or 12-character string, as follows:

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- Characters 1 and 2: Two characters to describe the regional location where the sample was collected. This will be "PR" for lower Passaic River.
- Character 3: One digit to describe the phase during which the sample was collected (i.e., "1" for Phase I and "2" for Phase II).
- Characters 4 and 5: Two characters to describe the sample matrix. This will be "WW" for whole water, "GD" for grab dissolved (field-filtered for metals) whole water, "GW" for grab whole water, "LD" for LSM dissolved, "LP" for LSM particulates, "HD" for HSM dissolved, and "HP" for HSM particulates
- Characters 6, 7, and 8: Three characters to signify a duplicate. These will be "DUP."

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Characters 9 and 10: A two-digit number (preceded by a hyphen) to describe the position of the duplicate in the sequence, sequentially numbered from 01 to 99.

Character 11: One character to describe the sampling attempt. "A" will be used for the first attempt, "B" for the second attempt, and "C" for a third attempt.

Character 12: One character to describe the HSM particulate fraction as two HSM particulate fractions may be encountered (e.g., fine material and non-fine material). "1" will be used for the fine fraction and "2" will be used for the non-fine (e.g., paper-like) fraction. The fine and non-fine material will only be analyzed separately for volatile organics (the material will be homogenized in the field for other analyses per SOP 4).

Following is an example of a field duplicate:

PR2WWDUP-03A

Explanation:

- ☐ The sample was the third field duplicate collected for whole water.
- ☐ This was the first collection attempt for this sample.

Following is an example of a field duplicate for HSM particulate sample in the event that two HSM particulate fractions are encountered:

PR2HPDUP-03A1

Explanation:

- ☐ The sample was the third field duplicate collected for HSM particulate.
- ☐ This was the first collection attempt for this sample.
- ☐ This sample was collected for the fine fraction of the HSM particulate solids.

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2.2.4.2 Equipment, Rinsate, and Field Blank Identification

Equipment, rinsate, and field blank samples will be labeled by a unique nine-character string, as follows:

- Characters 1 and 2: Two characters to describe the regional location where the sample was collected. This will be "PR" for lower Passaic River.
- Character 3: One-digit to describe the phase during which the sample was collected (i.e., "1" for Phase I and "2" for Phase II).
- Characters 4 and 5: A two-digit number to describe the order in which blank samples are collected within the project, sequentially numbered from the beginning of the project (01-99).
- Characters 6 and 7: Two characters to describe the equipment with which the blank is associated. This will be "WW" for whole water (the whole water tank), "GM" for grab metals (the metals sampling tubing and filter), "LB" for LSM bulk (the LSM bulk tank, which is the same as the whole water bulk tank), "CF" for continuous flow centrifuge (CFC), "LD" for LSM dissolved, and "LP" for LSM particulate (the "LB" blank will become a "LD" or "LP" blank after separation by the laboratory, the "LB" designation is meant as an interim name for transport of the material to the laboratory).
- Characters 8 and 9: Two characters to signify the type of blank (i.e., "EB" for equipment blank, "RB" for rinsate blank, and "FB" for field blank). The blanks collected from the whole water/LSM bulk sample collection tank, CFC, and metals sampling equipment and tubing will be field blanks, the blanks from the stainless steel spoons/bowls will be rinsate blanks, and the blanks from the LSM separation laboratory equipment will be equipment blanks.

The following is an example of a blank sample:

PR203CFFB

Explanation:

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- ☐ The sample was the third field blank collected through the CFC during Phase II of the CSO investigation.

2.2.4.3 Trip Blanks

Trip blanks will be numbered by a unique ~~13~~-character string, as follows:

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Characters 1 and 2: Two characters to signify a trip blank, "TB."

Character 3: One character to denote the type of trip blank. Either a "V" for a volatile organic compound trip blank or a "M" for a metals trip blank.

Characters ~~4~~ through 11: Eight characters to describe the date using a two-digit month, two-digit day, and four-digit year (e.g., MMDDYYYY).

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Characters ~~12~~ and 13: A two-digit number (preceded by a hyphen) to describe the order in which trip blanks were collected that day. Each cooler with samples for volatile organic compound (VOC) analysis will contain a trip blank for VOC analysis. The first trip blank will be "01" and will increase sequentially through the day.

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Following is an example of a trip blank:

TBV01012011-02

Explanation:

- ☐ This sample is the second trip blank for volatile organic compounds collected on January 1, 2011.

2.2.4.4 Total Suspended Solids/Total Dissolved Solids Monitoring Samples

Grab samples taken approximately every ½ hour for total suspended solids (TSS)/total dissolved solids (TDS) monitoring will be identified by an 18-character string, as follows:

Characters 1 and 2: Two characters to describe the regional location where the sample was collected. This will be "PR" for lower Passaic River.

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<u>Character 3:</u>	<u>One digit to describe the phase during which the sample was collected (i.e., "1" for Phase I and "2" for Phase II).</u>
<u>Characters 4, 5, and 6:</u>	<u>Three characters to describe the sample type. This will be "CSO," "SWO," and "POT" (for publically owned treatment works).</u>
<u>Characters 7, 8, and 9:</u>	<u>Three characters to describe the sampling location. For example, "VER" for Verona Avenue.</u>
<u>Characters 10 and 11:</u>	<u>Two characters to describe the sample matrix. This will be "GW" for grab whole water.</u>
<u>Characters 12 through 15:</u>	<u>Four characters to describe the time the sample was taken using a 24-hour clock format. For example, "0915" would denote the sample was taken at 9:15 am.</u>
<u>Characters 16 and 17:</u>	<u>A two-digit number (preceded by a hyphen) to describe the sequence of the sampling event (either the first, 01, or second, 02) at the specified location.</u>
<u>Character 18:</u>	<u>One character to describe the sampling attempt. "A" will be used for the first attempt, "B" for the second attempt, and "C" for a third attempt.</u>

Following is an example of a grab whole water TSS/TDS monitoring sample:

PR1CSOVERGW0915-01A

Explanation:

- ☐ The sample was collected in the Passaic River as part of the CSO investigation.
- ☐ The sample was the first phase of the CSO investigation.
- ☐ The sample was collected from a CSO.
- ☐ The sample was collected at the Verona Avenue location.
- ☐ The sample matrix was grab whole water.

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~~Deleted:~~ December~~Deleted:~~ 2~~Deleted:~~ 2☐ The sample was collected at 9:15 am.☐ The sample was the first sample collected for this location.☐ This was the first collection attempt for this sample.

2.2.5 Sample Labeling

A label will be attached to each bottle used for sampling. When practical, the project number, sample matrix, laboratory designation, and sample identification code will be typed or printed onto the label before sampling. Once affixed to the sample container, the label will be protected from water and solvents with clear packing tape.

2.3 Sample Containers and Preservation

2.3.1 Sample Containers

To confirm that the samples are collected in certified, pre-cleaned containers, sample containers for this project will be supplied from commercial suppliers or laboratories. Sample containers will be cleaned to the quality control standard defined in USEPA's Office of Solid Waste and Emergency Response (OSWER) Directive #9240.0-05A. Certification of sample container quality per the OSWER directive will be kept in the project file.

Prior to use, the sample containers will be visually inspected for cracks, chips, or other damage. Damaged sample containers will not be used and will be disposed in the proper waste receptacle.

2.3.2 Sample Preservation

The contracted laboratory performing the analysis will provide certified, pre-cleaned and pre-preserved containers for samples, as appropriate. The samples will be placed on ice after collection, and shipping containers will be packed with additional ice, if needed, prior to shipment via overnight carrier.

~~2.3.2.1 Preservation of Liquid Samples for Volatile Organic Compound Analysis~~

Aqueous sample bottles for VOC analysis will be pre-preserved with sufficient hydrochloric acid to lower the sample pH to below 2 (no field testing or adjustment is performed).

~~Deleted:~~ and a pre-determined amount of the required preservative(s) for rinsate blanks~~Deleted:~~ In cases where field adjustment of pH is necessary, the procedures outlined below will be followed for the appropriate analysis. ¶~~Deleted:~~ The rinsate blank sample containers will be pre-preserved by the laboratory. Documentation of equipment and methods used in preservation, and field-adjustment of pH, will be maintained in a logbook. The chemicals and amounts used~~Deleted:~~ ed will be recorded. If refrigeration is necessary.

~~Deleted:~~ 2.3.2.1 pH for Rinsate Blanks/Equipment Blanks for Cyanide Analysis¶ Aqueous rinsate blank sample bottles for cyanide analysis will be pre-preserved with sodium hydroxide. Immediately following sample collection, the pH of the preserved sample will be determined and adjusted, if necessary, using the following procedure:¶

1. Close the bottle and gently invert it several times to mix the preservative with the sample.¶
2. Pour a small aliquot (a few drops) of the sample into a separate vial.¶
3. Test the aliquot in the vial with colorimetric pH paper appropriate to the pH being tested. If the pH of the sample is less than 12, increase the pH of the rinsate blank by adding 50 percent sodium hydroxide. Using a pipette, add 0.2 milliliters (mL) (four to five drops) of sodium hydroxide to the sample.¶
4. Close the bottle and gently invert it several times to mix the preservative with the sample.¶
5. Pour a small aliquot (a few drops) of the sample into a separate vial.¶
6. Repeat this process until the correct pH (greater than 12) is achieved. The aliquots used for testing the pH will be disposed in accordance with SOP No. 9 – Management and Disposal of Residuals. The amount, type, and procedures will be documented in the logbook in accordance with SOP No. 7 – Field Documentation.¶

... [1]

~~Deleted:~~ 4~~Deleted:~~ Rinsate Blanks/Equipment Blanks for~~Deleted:~~ rinsate blank~~Deleted:~~ rinsate blank below a pH of~~Deleted:~~ . Rinsate blanks for VOC analyses will be prepared using the following procedure:

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1. Slowly pour sample into pre-prepared VOC vial until a meniscus is formed on the top of the vial.
2. Carefully cap the VOC vial and gently invert the vial to check for air bubbles.
3. Repeat process until no air bubbles are present. Dispose VOC samples with air bubbles in accordance with SOP No. 9 – Management and Disposal of Residuals.

2.3.2.2 Preservation of Liquid Samples Containing Residual Chlorine

In accordance with Worksheet #19-1, aqueous samples for semivolatile organics, organochlorine pesticides, semivolatile organics (SIM), polychlorinated dibenzo-*p*-dioxin (PCDD)/polychlorinated dibenzofuran (PCDF), polychlorinated biphenyl (PCB) congeners, and chlorinated herbicides may require preservation with sodium thiosulfate due to the presence of residual chlorine.

Following mixing of the whole water/LSM bulk sample tank and collection of whole water metals sample from the whole water/LSM bulk sample tank, proceed to test for presence of residual chlorine in the bulk aqueous sample. Pump an aliquot of the bulk sample from the tank into an unpreserved sample container to test for residual chlorine using Hach® test strips. If the test indicates presence of residual chlorine, preserve the sample containers with sodium thiosulfate for analyses listed above. The procedure for residual chlorine testing and preservation is detailed in SOP 4 – Sample Processing and Collection, Section 2.2.3.

2.4 Sample Handling and Shipping

Sample packaging and shipping will be done as described below:

1. After filling a sample container, affix cap and securely seal with clear or electrical tape (except for samples to be analyzed for VOCs) and complete the sample label. Apply the label to the sample container and cover with clear tape.
2. Clean the outside of each sample container by wiping it off with a clean paper towel.
3. Seal each sample container inside a sealable plastic bag. Samples for VOC analysis will be packaged together in a sealed plastic bag.
4. Place samples on ice or similar chilling source immediately after collection.
5. Transfer the samples to a plastic-lined ice chest, which will be used as a shipping

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container. Use packaging material (e.g., foam peanuts, cardboard, vermiculite) to cushion the samples and minimize the potential for breakage. Seal the drains on the ice chest (if present) with shipping tape.

6. Place a trip blank for VOCs analysis in each cooler containing samples for VOCs analysis. Place a trip blank for metals analysis in each cooler containing samples for metals analysis.
7. Ice chests will contain ice or similar chilling sources sufficient to maintain a temperature of 4 degrees Celsius inside the cooler during transport. Use sufficient ice to accommodate reasonable delays in shipment. A temperature blank provided by the analytical laboratory (or by the field crew) with each cooler will be included in the shipment.
8. Complete sample tracking documentation, and place the documents in a sealable plastic bag inside the ice chest, taped to the inside of the lid. Prior to sealing for shipment, check the list of samples against the container contents to verify the presence of each sample listed on the chain of custody.
9. Secure chest lid with shipping tape by covering the entire seal with tape. Complete information on the custody seal and affix the custody seal over the taped seal. An example of a custody seal is attached to this SOP.
10. For ice chests containing rinsate blanks for dioxin/furan analysis, affix flammable liquids labels to the outside of chest, and complete the dangerous goods declaration form, as required by the overnight carrier.
11. Transport the shipping container directly to the laboratory, the laboratory courier, or to the overnight carrier for overnight delivery. Once sample processing has been initiated, samples will be shipped or transported by close of the same day. Rinsate blank samples will also be shipped by close of the same day with the appropriate SDG.

2.5 Sample Tracking

From the time of collection through transport, the handling of samples will comply with chain of custody procedures. Completed and signed Bulk Sample Collection Forms will be provided by the samplers to the Sample Processing Area personnel when relinquishing the collected bulk effluent for sample processing. The Sample Processing Area personnel will sign the Bulk Sample Collection Form, accepting custody of the bulk samples.

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A sample is considered under the sampler's custody if one or more of the criteria are met:

- ☐ sample is in the sampler's possession
- ☐ sample is in the sampler's view after being in sampler's possession
- ☐ sample was in the sampler's possession and then locked up to prevent tampering
- ☐ sample is in a designated secure area.

Samples collected for analysis will be continuously tracked in the Sample Processing Area and while in transit to the laboratory by use of the following procedures. The Sample Processing Area will be secured (locked) with limited access:

1. Pertinent information will be entered on the Chain of Custody Form in the field. Assignment of the SDG number, matrix spike/matrix spike duplicate assignments, and the analyses requested for each sample will be made on both the SDG Tracking Log (see attached SDG Tracking Form) and the Chain of Custody Form.
2. The Chain of Custody Form must include the following, as required by guidance in SW-846, Test Methods for Evaluating Solid Waste (USEPA 1993): 1) project name; 2) signatures of samplers; 3) sample number, date and time of collection, and composite sample designation; 4) signatures of individuals involved in sample transfer; and 5) if applicable, the air bill or other shipping number.
3. The completed Chain of Custody Form will be signed, dated, enclosed in a sealable plastic bag with a copy of the SDG Tracking Log, and placed in the container prior to shipment. A copy of both documents will be retained by field personnel and stored in a dedicated binder. Additional copies will be distributed as follows:
 - a copy will be faxed or e-mailed to the Investigative Organization or the Investigative Organization's designee
 - a copy will be faxed or e-mailed to the data validator
 - a copy will be faxed or e-mailed to the laboratory manager/client service representative at each laboratory being used.
4. Samples will be considered in the sampler's custody while in his/her possession, within the sampler's sight, or locked in a secure area prior to shipment. If the

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person packing the container and verifying the sample list is different than the sampler, both the sampler and the packer will sign the Chain of Custody Form.

5. Upon receipt at the laboratory, the designated laboratory sample custodian will sign the Chain of Custody Form, indicating receipt of the incoming field samples. The samples will be checked against the Chain of Custody Form upon arrival at the laboratory. The receiving personnel will enter all arriving samples into a laboratory logbook. Any discrepancies between the samples and the Chain of Custody Form(s), or any evidence of tampering with the shipping container or the custody seal, will be immediately reported to the Investigative Organization. The sample custodian will immediately check the temperature of the cooler upon arrival at the laboratory and record the measured temperature on the Chain of Custody Form and in a laboratory logbook.
6. A completed copy of the Chain of Custody Form will be distributed to the following individuals on the day of sample receipt at the laboratory:
 - o a copy will be faxed or e-mailed to the Investigative Organization or the Investigative Organization's designee
 - o a copy will be faxed or e-mailed to the data validator
 - o a copy will be faxed or e-mailed to the field office.

The original will be retained by the laboratory's sample custodian.

3. Documentation

3.1 Field Notes

Documentation of sample handling activities will be conducted in accordance with SOP No. 7 – Field Documentation. The following information should also be included in the logbook (at a minimum):

- ☐ sample IDs collected on that day
- ☐ brief synopsis of types of equipment and methods used in collecting the samples

3.2 Chain of Custody Documentation

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Samples will be tracked through chain of custody documentation as described above.

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4. References

Tierra. 2010. Health and Safety Plan. Lower Passaic River Study Area CSO/SWO Investigation. Tierra Solutions, Inc. East Brunswick, New Jersey. Revision 0. In Progress.

USEPA. 1993. SW-846, Test Methods for Evaluating Solid Waste, Third Ed., including Promulgated Update I, Chapter One.

USEPA. 1996. Method 1669, Sampling Ambient Water for Trace Metals at EPA Water Criterion Levels, U.S. Environmental Protection Agency, Office of Water Engineering and Analysis Division (4303), July 1996.

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PRE-PRINTED SAMPLE LABEL

	PROJECT #: (1)
	PROJECT NAME: Phase I Removal Design Program
SDG #: (2)	
SAMPLE #: (3)	DATE SAMPLE COLLECTED: (4)
TIME SAMPLE COLLECTED: (5)	
LABORATORY: (6)	
SAMPLE MATRIX: (7)	
ANALYSES REQUIRED: (8)	
PRESERVATIVE: (9)	
SAMPLER: (10)	
REMARKS: (11)	

Key:

- (1) Company-specific project number, if appropriate
- (2) SDG Number
- (3) Sample Number (e.g., PR2CSOVERLB-01A)
- (4) Date sample was collected from the bulk effluent (e.g., 1/1/2009)
- (5) Time sample was collected from the bulk effluent (24-hour format)
- (6) Laboratory used for analyses
- (7) Sample matrix type (e.g., water)
- (8) Analyses required for sample
- (9) Preservative(s) used on sample (pre-preserved by the laboratory)
- (10) Sampler name
- (11) Remarks pertinent to proposed analyses

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CHAIN OF CUSTODY FORM

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CHAIN OF CUSTODY FORM KEY

- (1) SDG Number (e.g., LPR103).
- (2) Page number and total number of pages for the set of chain of custody form submitted with the samples for analysis.
- (3) Analytical laboratory's internal work order number (to be completed by analytical laboratory).
- (4) Address where the analytical results are to be sent, project identifiers (location and internal project numbers) and sampler's signature.
- (5) Preservation methods and bottles.
- (6) Sample ID (e.g., PR2CSOVERLB-01A).
- (7) Date and time (24-hour format) of sample collection.
- (8) Check if sample was a composite sample.
- (9) Sample matrix (e.g., water).
- (10) Provide analysis and method for which sample is being submitted. Check the appropriate box for which analyses the sample is being submitted.
- (11) Provide any pertinent comments regarding the sample submitted for analyses (e.g., not enough sample volume for full analyses).
- (12) Provide any special instructions to the analytical laboratory.
- (13) Provide any special quality assurance/quality control instructions to the analytical laboratory.
- (14) Provide details regarding the cooler shipment (analytical laboratory name, whether the cooler was packed with ice, turnaround requirements, and shipping tracking number).
- (15) Provide details as to receipt of cooler (to be completed by analytical laboratory on receipt). Indicate if the chain of custody seal was intact and the cooler temperature upon receipt.
- (16) Signatures for custody to be completed by sampler and analytical laboratory.

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SOP No. 8: Containers, Preservation, Handling, and Tracking of Samples for Analysis

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SDG TRACKING LOG

SDG Number _____(1)_____ SDG Open Date _____(3)_____

Sample Matrix _____(2)_____ SDG Close Date _____(4)_____

Sample #	Sample ID	MS/MSD	Comments
1	(5)	(6)	(7)
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
Rinsate Blank	(8)	N/A	(9)
Trip blank	(10)	N/A	(11)

Notes:

1. The SDG must not exceed 20 field samples. Rinsate blanks do not count towards the sample total. Check which of the 20 samples have been collected to include extra volume for MS/MSD and assign as such.
2. 3x the weights listed should be collected for lab QC (i.e., MS/MSD/internal lab duplicate).
3. Field duplicate is a separate sample, not to be confused with "internal lab duplicate."

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SDG TRACKING LOG KEY

- (1) SDG number (e.g., PR201).
- (2) Matrix of samples in this SDG (e.g., water).
- (3) Date first sample in SDG is collected.
- (4) Date last sample in SDG is collected.
- (5) Sample ID (e.g., PR2CSOVERLB-01A).
- (6) Check if an MS or MSD analysis should be performed on this sample. If an MS or MSD is to be performed, note in the "Comments" column which analysis the MS/MSD should be performed for. If the sample is not to be analyzed for a MS/MSD, then leave blank.
- (7) Provide any pertinent comments regarding the samples submitted for analyses (e.g., "MS for Herbicide").
- (8) Rinsate blank ID (e.g., PR203CFRB).
- (9) Provide any pertinent comments regarding the rinsate blank submitted for analyses.
- (10) Trip blank ID (e.g., TBV01012010-02).
- (11) Provide any pertinent comments regarding the trip blank submitted for analysis.

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Custody Seal

SEALED BY (1) _____ DATE (2) TIME (3) _____
--

Key:

- (1) Name of individual sealing ice chest.
- (2) Date ice chest is sealed.
- (3) Time ice chest is sealed (24-hour format).